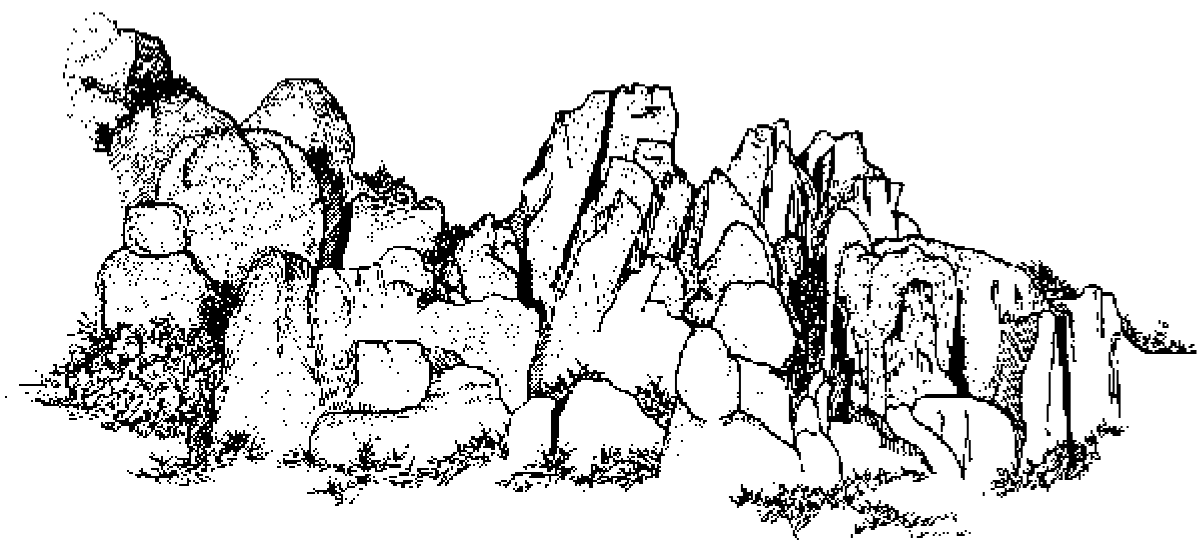
Environmental Assessment of Chalone Creek Restoration in Pinnacles National Monument



A Project of the
National Park Service

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Chalone Creek Restoration Environmental Assessment

INTRODUCTION

Pinnacles National Monument (PNM, Figure 1) was established by Proclamation 796 on January 16, 1908, to protect for its scientific interest, the natural formations known as the Pinnacles Rocks. PNM came under the protection and management of the National Park Service (NPS) when the Service was created by the Organic Act of August 12, 1916. The purpose of the National Park Service is to conserve the natural resources in perpetuity and provide for public enjoyment of these resources in such a way as to not impair them. Since its initial proclamation, PNM has had 8 boundary increases, the most recent in January 2000 bringing the total acres to approximately 24,000. In 1976, approximately 13,220 acres of PNM became designated wilderness, with an additional 325 acres of the land designated as potential wilderness. The most recent boundary expansion included 2,250 acres of Wilderness Study Areas.

PNM preserves a unique mixture of volcanic pinnacle formations and the best example of a coastal broadleaf chaparral ecosystem found in the NPS. The pinnacles are the remains of a 23 million-year-old Miocene volcano, and PNM contains some excellent talus cave formations. The landscape is one in constant change and demonstrates the effects of weathering, block faulting, frequent earthquakes, fire, and flooding. PNM contains numerous archeological, historical, and architectural resources.

Chalone Creek is the master watershed for 95% of PNM's land area. Chalone Creek is an intermittent stream in most of PNM, flowing for approximately 5 months per year. Although Chalone Creek is intermittent, during the summer and fall some small sections continue to flow. These sections are critical water sources for wildlife. The creek is characterized by sand and cobble streambeds, often erodible banks, a variety of stream patterns and grades, and limited floodplains. Modest rainfall and a shallow groundwater aquifer feed Chalone Creek. Much of the length of the stream has been altered in past decades by direct manipulation of the channel such as clearing and bulldozing, as well as indirect impacts by near-stream development.

PURPOSE AND NEED FOR THE ACTION

The National Park Service proposes to restore 3 km of stream and floodplain. The restoration effort would be divided into four phases, each addressing a different section of Chalone Creek and using different tools to achieve the desired objectives. Each phase is a stand-alone project that improves stream function and health. However, the phases combined provide the greatest restoration potential. It is unlikely that funding and human resources could be secured to accomplish all 4 phases in a single year. Therefore, it is anticipated that each phase would be initiated and completed separately instead of concurrently. The 4 phases of the proposed project would be implemented over a 3-6 year period [Figures 1 and 2].

The Old Pinnacles Road is a dilapidated 3-km raised gravel road that wanders back and forth through the floodplain and riparian corridor (i.e. the area and vegetation related to rivers) of Chalone Creek. Used by vehicles until 1974, it is now passable only by foot and portions of it are currently used as a trail. It acts as a dike, confining overbank flow and the ability of the stream to access its floodplain. Floodplains are not only depositories for sediment load, they dampen flood peaks, delay onset of flash flooding, pull pollutants out of the stream system, and are ecologically crucial to semi-arid landscapes. Without overbank flow, stream power, flow velocity, shear stress, erosion, and sediment loads are increased. Recent research demonstrates the raised roadbed severely alters the natural fluvial process (i.e. related to streams and rivers) by confining the stream's flow and preventing the stream from flowing over its banks to access the floodplain [Figures 2.1 and 2.2]. This confinement increases channel bank erosion, incision, and sediment transport. Not only does the road have effects locally, but also the effects of the road propagate at least 3 km downstream. This disturbed fluvial system affects the riparian corridor and its function in general and specifically affects the habitat of the California red-legged frog (*Rana aurora draytonii*, CRLF); a federally listed threatened species. Many of these problems became evident during a 40-year flood event in 1998 [Figure 3]. In areas where the creek was confined by the road, significant scour and extremely high sediment loads were observed. Erosion monitoring markers, placed 1 meter deep into the streambed, were scoured out. Downstream of this section, the channel aggraded (raised) with massive deposits of sand and gravel, channel sinuosity increased, the channel widened, and significant bank erosion occurred. Without the "pressure relief valve" of the floodplain, this altered stream behavior will continue. The changes in stream behavior are partly to blame for the destruction of a road bridge in 1998, and the subsequent $1.5 million cost of rebuilding. The increased channel scour and fill destroyed nearly all of the summer pools required for year-round habitation by the CRLF. The rapid channel bank erosion also destroyed vegetation and shelter in some riparian areas, sharply reducing the habitat value. This damage illustrates the need for PNM to implement a restoration action.

The Organic Act of 1916 clearly directs NPS units to conserve the natural resources in perpetuity, and data collected in PNM clearly indicate that the stream resources are imperiled. Additionally, section 7(a) of the Endangered Species Act of 1969 clearly calls for federal agencies to take actions to further the recovery of listed species. The proposed restoration project would return the floodplain cross-section to its "original" dimension and hydrologic character. Water would be able to access the floodplain at much lower discharges, thereby restoring natural physical processes closely linked to biotic processes in the riparian corridor. Removal of this artificial structure is expected to allow the channel to gradually readjust to pre-disturbance conditions, thereby restoring the stream resource and conserving its integrity as well as improving the CRLF habitat and assisting in its recovery at PNM.

GOALS AND OBJECTIVES

The primary goal of this project is to allow natural overbank flow and floodplain access and to restore natural fluvial processes. This would reduce sediment load during medium or large flood events and improve resilience of stream features such as cohesive banks, deep pools, and dense bank vegetation. The second goal is to improve riparian plant communities by increasing natural structure and composition, restoring natural hydrology, and reducing bank erosion. The third goal is to improve trail infrastructure, lower trail maintenance, and decrease the interruption of visitor services. The fourth goal is to foster a greater appreciation by park visitors and staff for riparian ecology and the importance of restoration. The fifth goal is to continue to build a foundation of basic scientific data and information, from which sound management decisions would be made.

In order to measure our success in accomplishing these goals, a number of measurable objectives have been developed. The first objective is to increase accessible floodplain area, increase the flood prone width, and realign the trail [Figure 4]. The second objective is to remove the aesthetic and functional impacts of an abandoned quarry and borrow pit by recontouring and revegetating the area. The third objective is to learn from this restoration effort and set the stage for long term monitoring and documentation that would provide the data for future management decisions related to projects in stream corridors and projects related to ecosystem restoration. The proposed project would restore the stream system to a pre-disturbance state. The trail system would then be reconnected and located in a more desirable location.

ISSUES AND IMPACT TOPICS

Specific impact topics were developed for discussion focus to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal laws, regulations, and Executive Orders; 2001 NPS Management Policies; and NPS knowledge of limited or easily impacted resources. A brief rationale for the selection of each impact topic is given below, as well as the rational for dismissing specific topics from further consideration.

Impact Topics Included in this Document:

<u>Stream Characteristics and Flooding</u>: The evolution of Chalone Creek is a dynamic geologic process. NPS Management Policies direct the park service to maintain natural processes unimpeded. Chalone Creek’s propensity for flash flooding and high sediment loads can create management difficulties. The project alternatives would affect overall stream characteristics (flow, streambed, and relation to floodplain). Likewise, alternatives are expected to affect flooding frequencies and intensities. Therefore, stream characteristics and flooding is discussed in the impact analysis.

<u>Floodplains, Wetlands, and Soils</u>: Floodplains are rapidly evolving geomorphic features that can be very responsive to human activities. The frequency of flooding, the depth and width of the nearby channel, and their vegetative cover control them. Not only are floodplains easily impacted, they are often a significant risk to structures built upon them. Floodplain soils are often unique in character and productivity. Because these soils are a product of stream behavior, they are closely linked to activities in the riparian zone. Therefore, both floodplain geomorphology and soils is considered in the impact analysis.

Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains and wetlands. Certain construction within a 100-year floodplain requires that a Statement Of Findings be prepared and accompany a Finding Of No Significant Impact. Although the project site is within the 100-year floodplain, compliance with Executive Order 11988 (*Floodplain Management*) is not required. Although some of the alternatives presented require minimal construction within the floodplain, the proposed project would not construct habitable or enclosed structures upon the floodplain, but rather restructure the floodplain to its historic (natural) profile. Executive Order 11990 (Protection of Wetlands) requires federal agencies to avoid, where possible, impacts on wetlands. For the proposed project, avoiding wetlands is not possible because the project is a wetland restoration. Although the project is in a wetland (a stream corridor), the project is not destroying wetlands, but rather restoring the stream system. The scope of this project, restoration, is not intended to be covered under these Executive Orders and therefore, no Statement of Findings for floodplains or wetlands would be prepared.

<u>Water Quality:</u> Ground disturbance activities near and within stream channels have the potential to increase waterborne fine sediment loads. Floodplains are also an important aspect of the fluvial system for metering sediment flow. Although Chalone Creek is not a “listed” stream (Clean Water Act, section 303) for fine sediment problems, an analysis of fine sediment is warranted. Because all heavy construction would be conducted while the stream is not flowing, impacts to be addressed would focus on long-term impacts. Precautions would also be needed to cover the potential for contamination from heavy equipment leaks. Water quality is discussed as an impact topic.

Section 404: The U.S. Army Corps of Engineers (COE) issues permits for work affecting wetlands and navigable waters of the United States as defined in Section 404 of the Clean Water Act (33 USC 1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 USC 401 et seq.). This project is subject to COE jurisdiction. Therefore, the NPS would need to obtain a 404 permit prior to implement the selected action.

Section 401: The project requires compliance with General Condition 9 (water quality, Section 401 of the Clean Water Act) of the COE Nationwide Permit process. Clean Water Act section 401 certification or waiver of certification would be obtained through the California Central Coast Regional Water Quality Control Board, San Luis Obispo, California, prior to construction. In-stream work would proceed in as short a time as possible and would be done during no flow periods, July 1 through November 15. Due to the nature of the proposed construction site and timing, no increase in sediment load introduced into the creek is expected.

<u>Riparian Vegetation:</u> The National Environmental Policy Act (NEPA) calls for an examination of the impacts on all components of affected ecosystems. NPS policy is to protect the natural abundance and diversity of PNM's natural communities. Riparian ecosystems harbor the majority of biodiversity in semi-arid systems, such as PNM. This vegetation community supports numerous plant and animal species and acts as a corridor system within the landscape allowing for animal migrations and movements. Dominant plant overstory species include live oak, willow, sycamore, cottonwood, and gray pine. Riparian vegetation is impacted by the hydraulic environment and exerts impacts on the physical processes. Vegetation is therefore a critical feedback process in the riparian ecosystem. Since all alternatives would involve manipulation of natural resources, the riparian community is addressed as an impact topic.

<u>Species of Special Concern</u>: The United States Fish and Wildlife Service (USFWS) lists 15 special status species that occur within San Benito County and may be found within the project area. Surveys conducted by monument staff and further consultation with the USFWS has demonstrated that the only listed species likely to range within the project area is the California red-legged frog. Additionally, this section of creek is designated critical habitat for the California red-legged frog. The California Department of Fish and Game lists 21 species of special concern that occur within San Benito County and may be found within the project area. Surveys conducted by monument staff has demonstrated that 8 of these species are likely to be in the project area (pallid bat, Townsend’s big-eared bat, western mastiff bat, Cooper’s hawk, sharp-shinned hawk, long-eared owl, southwestern pond turtle, and Pinnacles riffle beetle). These species have the potential of being affected by the project. Therefore, special status species is addressed as an impact topic.

<u>Non-native Species</u>: This project requires the movement of approximately 12,000 cubic meters (15,500 cubic-yards) of material. Any time there is large-scale movement of soil and ground disturbance there is a chance of exotic plant species invasions or expansions of current infestations. Therefore, non-native species is addressed as an impact topic.

<u>Air Quality, Traffic, and Noise</u>: Alternatives requiring earth movement have the potential to create dust, traffic congestion, and noise. Dust is typically larger than 10 microns, and would impact a localized area mostly within the Monument boundary. Traffic flow may be impacted due to staging activities and fill hauling operations, and noise is common with heavy machinery. Therefore, these topics are addressed.

<u>Visitor Use and Experience</u>: Under the Organic Act of 1916, the National Park Service is directed to provide visitor enjoyment of the natural resources in PNM in such a way as to leave the resources unimpaired for future generations. Alternatives requiring earth movement would temporarily affect visitor use. Historically, visitor access through this area has been interrupted during and after flooding events. One of the goals of this project is to reduce these visitor use interruptions. NPS is directed to conserve scenery for visitor enjoyment and riparian areas are generally considered aesthetically pleasing to visitors. Therefore, visitor use and experience is addressed as an impact topic.

<u>Historic Cultural Resources:</u> The early origins of the Old Pinnacles Road are unclear although a 1929 map of PNM shows roads accessing either side of the Balconies area. The road on the east side of the park followed the western side of Chalone Creek up to the Marcotts Spring (Willow Spring) area and provided access for travelers and local residents in the Hollister area. The CCC began construction of a new road (in lieu of the older one) in April 1934. Because this area was the original east side access to PNM and it has connections to the CCC Era, an important time for PNM, historic cultural resources is addressed as an impact topic.

<u>Wilderness</u>: Legislation in 1978 created a 12,952-acre wilderness and delineated 325 acres of potential wilderness within PNM. In January 2001, approximately 8,000 acres of Bureau of Land Management lands were transferred to the National Park Service. Of these lands, approximately 2,250 acres are wilderness study areas, land that must be managed as designated wilderness. A portion of the project is within designated wilderness [Figure 5] and access to wilderness would be affected. With the removal of the Old Pinnacles Road, a section of approximately 60 acres could be considered for wilderness designation. Therefore, wilderness is addressed as an impact topic.

Impact Topics Dismissed from Further Analysis:

Pre-History Cultural Resources: The *Statement for Management, Pinnacles National Monument*, 1980, indicates that there are no known ethnographic resources at PNM. The *Final Master Plan, Pinnacles National Monument*, 1975, indicates that there are no known archeological resources within the proposed project area. The work area has been surveyed by an NPS Archeologist, Roger Kelly, and was cleared of any archeological impacts. Although no artifacts are expected to be found in the work site, all workers would be informed of the penalties for illegally collecting artifacts or intentionally damaging any archeological or historic property. Workers would be trained to recognize artifacts common to the area. Workers would also be informed of the correct procedures in case previously unknown resources are uncovered during construction activities. Therefore, pre-historic cultural resources are dismissed as an impact topic in this document.

Other Topics: The Council of Environmental Quality established impacts topics that must be considered in all NEPA documents. These mandatory topics are: possible conflicts with the proposal and previous plans and policies; energy requirements and conservation; natural or depletable resource requirements; urban quality; social or economically disadvantaged populations; prime agricultural lands; wild and scenic rivers and ecologically critical areas; sacred site and Indian Trust resources; and public health and safety. Each of these topics was analyzed related to the potential alternatives. Each was dismissed because of lack of relevance to and/or lack of impact from the proposed project.

ALTERNATIVES

The alternative section describes two management alternatives for this project. The no action alternative describes the action of leaving Chalone Creek, No-name Dike, and the Old Pinnacles Road as it is and allows for the continued erosion of the old roadbed and dike and gives the creek limited access to the historic floodplain. The no action alternative provides a basis for comparing the management direction and environmental consequences of the alternative actions. The environmentally preferred alternative is Alternative B – Restoration. Alternative B removes the stressors and/or replaces the functional elements of the stream-floodplain connectivity while allowing the stream to find its own equilibrium. Alternative B would have no major negative impacts to the stream, wildlife or plants in PNM and would have minor, but temporary, impacts to visitor use and enjoyment. The NPS preferred alternative is Alternative B. The level of impacts associated with Alternative B would not be significant. All actions described in the proposed action would be consistent with the approved 1975 Master Plan, 1993 East unit DCP, and related monument documents.

A summary table comparing the environmental consequences of each alternative is presented on page 11 of this document.

Alternative A

Alternative A is the no-action alternative. With this alternative, the elevated roadbed would continue to limit floodplain access throughout most of the road’s course. Eventually, lateral erosion processes would remove the roadbed and in the process of doing so, the stream would sacrifice much of its floodplain. This process would be expected to take several decades and numerous flood events. Until overbank flooding processes were returned, the formation of floodplains would continue to be halted. Furthermore, the additional eroded material would cause continue to degrade habitat on-site and downstream. Once the stream fully adjusted, the resulting riparian system might be ecologically and physically quite different from the pre-disturbance condition. It is anticipated this “new” stream would be at a different equilibrium and may not support current plant and animal species.

The riprap protection to the No-name dike is not sustainable in the long term. Eventually, the maintenance access road across the dike would be compromised. The present configuration of this structure offers no habitat value, increases erosion rates locally and degrades riparian areas downstream due to increased deposition. This section of roadbed is also elevated above the floodplain terrace and prevents stream access to the area and would be likely to impound water behind it during heavy rain.

The trail system along this portion of Chalone Creek would continue to be precariously located. Visitor access along the trail has been interrupted three times in the last two decades due to flood damages. This impact to visitor enjoyment occurred during the spring when visitor numbers are highest. Additionally, the process of maintaining the trail infrastructure in locations where it is in conflict with natural processes incurs a greater workload and at an increased cost.

Although there would be substantial savings by not implementing an action, costs would be transferred into the future at a potentially higher cost. Species recoveries can be very expensive, especially if habitat reconstruction is necessary. Improving the health of the entire riparian system can avert such efforts. Additionally, some of the dynamic behavior of Chalone Creek can be attributed to the lack of floodplain access and resultant higher sediment loads and increased flood intensities. In 1983, 1995, and 1998, erosion due to flooding was responsible for several million dollars of damage to park facilities. These long-term costs would likely be reduced by stream restoration.

Alternative B

This alternative would implement "semi-passive" restoration. "Passive" restoration is one in which the stressor or artificial element to a natural system is removed. In contrast, "active" restoration reconstructs a desired natural condition. In active restoration, the stressor would be removed, the stream and floodplain would be constructed to the ideal condition and both process and form of the natural system would be replaced. Semi-passive restoration is a blend of these two approaches and is proposed in this alternative. This alternative would remove stressors (e.g. the roadbed and riprap lining) and efforts would be made to restore natural processes without dictating or constructing a specific form onto the natural system.

Such a hybrid effort has advantages and drawbacks. Semi-passive restoration should be less expensive than active restoration. It allows the natural system; in this case a stream and riparian vegetation community, to establish its own shape and character. It is assumed that such a final state would be similar to the pre-disturbance condition and support a similar suite of species, but it is not guaranteed. This approach implies a natural resilience in the system and if given a chance, nature would heal itself. In systems that are badly disturbed, this may not be the case.

<u>Overview:</u> This alternative has 4 phases to be implemented independently [Figure 5]. While each could stand alone as a separate beneficial project, they are considered together here to streamline the NEPA process as well as to present the larger conceptual picture of Chalone Creek Restoration. Phase I would remove 500 linear meters (5400 cubic meters of material) of abandoned roadbed [Figures 5 and 6]. Of the 5400 cubic meters of earth removed, 1900 cubic meters would be placed into abandoned quarries, borrow pits, and local scours to repair past flooding damage and 3500 cubic meters would be removed off site. Filled areas would be compacted, recontoured, and revegetated. Phase II would remove 700 linear meters (7500 cubic meters of material) of abandoned roadbed. Of the 7500 cubic meters of earth removed, 5000 cubic meters would be placed into abandoned quarries and borrows and 2500 cubic meters would be removed off site. Filled areas would be compacted, recontoured, and revegetated. Phase III would remove riprap lining the No-name dike west of the Chalone Creek Picnic and Housing Area. Three rock barbs would be constructed in the stream channel to hasten floodplain development and realign the active creek channel to its 1994 course. In between the rock barbs, extensive bioengineering techniques would be used to stabilize the bank. While the road bed would be preserved for driving access to the maintenance yard, the elevation of the bed would be decreased 0.5 to 2 meters to make it level with the floodplain east of the dike. All of the 1500 cubic meters of earth removed from the dike would be taken off site. Phase IV would realign segments of trail from the north end of phase I to the junction of the Balconies Cliffs and Balconies Caves Trails. 50 cubic meters of earth would be locally redistributed on site. A total of 366 meters of trail would be moved, with the old trail tread being rehabilitated and revegetated as needed.

<u>Elements Common to All Phases:</u>

Work Site and Equipment Preparation: Prior to earth moving, the work area would be delineated with signs and fences. Turn-around and staging areas would be delineated with construction fencing. Equipment routes would be flagged. Trees slated for cutting or removal would be clearly marked, and trees and plants to be protected would be encircled with construction fencing. The park botanist has identified trees to be preserved and sensitive plant areas. An appraisal was made as to the extent of salvage that may be possible. In general, most impacted areas have a low potential for plant salvage, although some salvage efforts would be made prior to earth moving. Because heavy equipment would be used in the removal of the levee, it is recommended that vegetation be appropriately cut beforehand. For example, shrubs that are run over by tracked equipment recovers more quickly if they are cut at the base instead of crushed. A few oak limbs hang low enough to snag equipment. These oaks would be limbed by park staff as directed by the park botanist in conjunction with the contractors. Small signs indicating surveyed cross-sections would be installed by the contractor in conjunction with the park physical scientist along the length of the project. These would enable the contractor to gauge progress and sculpt the appropriate cross section. Areas for topsoil storage would be identified.

Coincident with marking, interpretive displays would be erected. This would foster tolerance from park visitors as they contend with visual intrusions and temporary closure of the trail system during construction of Phase I. An interpretive sign would be erected at the point of trail closure, along with notice and warning sign at all potential trail connections.

Prior to any equipment arriving on site, all potentially impacted areas would be thoroughly searched for California red-legged frogs (CRLF) and other sensitive species. Because Pinnacles National Monument is designated critical habitat, this procedure has become standard on all construction projects. Additionally, a US Fish and Wildlife Service approved biologist would be on site during the entire earthmoving process.

Prior to earthmoving, all equipment traveling off pavement would be steam cleaned outside PNM. Park staff would inspect equipment at arrival. Work would be conducted outside of the rainy season so no water diversion, storm water management, or runoff mitigation would be necessary. Maintenance on heavy equipment would only be allowed in specified staging areas, and refueling would only be allowed on a prepared pad. The contractor would ensure adequate spill kits are available at the project site.

Vegetation Management: Large woody debris would not be introduced into the stream system. There is ample natural tree fall in the area. Instead, felled pines and oak limbs would be left on site. The main trunks would be left as intact as possible to provide wildlife habitat, while the small limbs and slash would be cut into smaller pieces to hasten decomposition and increase ground contact. Some trees would be too large to be left on site (>12 inches diameter or 40 feet in height, Figure 9) and would be removed to a temporary storage area where they could be used for other restoration projects, trail maintenance projects, or recycled. In order to maximize the effectiveness of the restoration program at Pinnacles, we have developed a multi-faceted approach. A combination of salvage, seeding and planting would be employed to reduce costs and maximize survival of native species. Each strategy is described below, along with an explanation of how it would be applied to each phase. In conjunction with restoration planting, we would continue to control non-native plants in the affected areas in order to reduce competition [Figure 7].

Save Soil: Much of the area affected by the road removal has a high percentage of native species in and adjacent to the sites. For this reason, there is likely a considerable seed bank present in the surface soil in these areas. In order to maximize the use of this native seed bank, it is recommended that, when possible, the top 2-3 inches of soil be saved off and reapplied to the site once the removal or addition of soil has been accomplished. This would promote the establishment of native seed in the areas and hasten recovery considerably. The contractor would accomplish this aspect of the revegetation planting, as they are removing soil from the area. This method would be used in phases I and II.

Seed: Many species can be effectively established in disturbed areas by collecting seeds prior to disturbance, then spreading the seeds over the area after recontouring has been completed. On-site seed collection would be performed at the appropriate time of year to maximize the viability of the seeds. Any stratification or scarification of seeds would be performed as needed for the species that are selected. This method would be used in all phases of the proposed project.

Salvage: Most species at Pinnacles have long roots that quickly grow down in search of water, finding cracks and openings to reach pocket areas where water might occur. This makes transplanting specimens very difficult, since many roots would be severed in the process and the likelihood of survival is low. There are some species, such as native grasses and ferns that have shallow root systems. These plants can be successfully taken out of the affected site, stored in pots for several years and replanted into the areas once the recontouring has been completed. Park staff would accomplish collection and replanting of salvage plants. Additionally, the biological soil crust will be salvaged by taking the top most layer of dry soil, storing it in a cool dry location, and returning it to the area collected. The soil crust would be re-spread over the are in a 1:20 ratio (1 square meter of soil collected would be distributed over 20 square meters).

Direct planting: Although many species would establish on the site through direct seeding or as seed drift from adjacent areas, some species are more difficult to propagate. For these species, cuttings or seeds would be collected from the park and propagated by a contract nursery and delivered back to us for planting. These plants would be delivered in the winter following completion of the recontouring of each phase for planting. Fertilizer would not be used. Watering of newly planted vegetation would only be allowed if the project commences during a drought year and then an application of 1-2 inches of water would only be allowed 1 time per week during the period of December through May. No watering would be allowed during June through November. Watering would only occur for plants planted in that year. Water would come from the Monument's water system and would be delivered to the revegetation sites by fire hose. This method would be used in all phases.

Exotic Plant Control: Because no fill would be imported and equipment would be steam cleaned, we expect only modest control efforts would be needed in the first two years and successive efforts in following years that would be covered by base funds. PNM has an established exotic plant control program that would manage weed control in the following years. This would be an issue for all phases and would be incorporated in to current annual operations.

Soil Management: Topsoil would be salvaged throughout the area, temporarily stored, and redistributed later. Soil would be stored by revegetation zone (areas of like species and plant communities) and distributed within each zone. In general, topsoil would be cut to a depth no more than 2-3" (5-7 cm) and be taken from the hill slope side of the road embankment, as opposed to the streamside. Volume of topsoil salvaged and stored in each zone is shown in Figure 8. Due to the nature of Phases III and IV, there would be no topsoil removal and thus no need for topsoil management.

No fill would be imported. Consequently, there are no concerns of soil organics, chemistry, or inocula. Spreading of salvaged topsoil over impacted areas would aid in recovery speed and plant revegetation. Additionally, because impacted areas are generally narrow strips, the proximity to seed sources and natural redistribution of topsoil would ease recovery efforts. Several areas would be recontoured using excavated fill. These would require compaction by heavy equipment to prevent slumping and excessive erosion. Because the material would be dry and composed of graded material, no geotechnical standards would be required. During placement, equipment tracks should provide adequate compaction.

A certain roughness and unevenness is desired for a final grade. Floodplain surfaces would have microtopography typically varying –0” / +6” (15 cm) in elevation from design cross-section. Peak to valley distance is optimally 6” (15 cm), but no upper or lower limits would be set. This would produce small variations in soil moisture content, improve plant diversity, and increase hydraulic roughness of floodplain surface. Caterpillar tracks are desirable on excavated and filled surfaces because they provide the desired unevenness and soil microtopography.

Returning the floodplain to original grade would require the removal of several thousand cubic meters of fill. A vast majority of this fill would be removed from PNM entirely and transported to a commercial aggregate facility. The removed material is clean, and consists of a gap-graded mixture of sand and gravel. A facility 30 miles north of PNM near Hollister would be interested in taking the material.

Monitoring and Maintenance: Restoration areas need tending, maintenance, and monitoring. Plant mortality due to flooding or drought is not uncommon. Thus, additional planting may need to be done to reach revegetation goals. Number and species of plants would be tracked throughout the restoration project so mortality/success rates could be determined. This data would also guide efforts should additional plants be needed.

Existing agreements with US Fish and Wildlife Service require follow-up monitoring of CRLF populations at and downstream of actions. There is a comprehensive data set of CRLF populations in PNM with which to compare the positive or negative effects of this restoration project.

To determine the success of the restoration project, and identify any weakness that needs repair, geomorphologic monitoring would be required (Kondolf 1995). This would entail detailed mapping and diagramming of as-built condition, and annual inspection of bioengineering works that may require additional work. The entire project area already has a comprehensive survey of moderate detail, however more detailed surveys would be added. Two areas, one within the project area and another 2-km downstream would serve as long-term monitoring stations. These would enable long-term monitoring and would be integrated into PNM stream monitoring program and vital signs program. The many phases of the project would be photographically documented and a report incorporating all relevant data compiled.

<u>Phase I:</u>

500 linear meters of abandoned roadbed would be cut to original ground and removed. Of the 5400 cubic meters of earth removed, 1900 cubic meters would be put into local scours and abandoned quarries within PNM and 3500 meters would be removed off site. Filled areas would be compacted and recontoured. The trail system that now follows atop the roadbed for much of its course would be realigned and improved. A footbridge that is inadequately sized to span the creek would be replaced by a longer span and re-aligned to allow a wider stream passage [Figure 10]. This trail and bridge re-alignment would require the closure of the Old Pinnacles Trail for approximately 4 weeks. The area is too confined to safely allow visit access while large machinery moves through the area.

A number of bank areas would be restored, including the banks knocked down by equipment, a former footbridge abutment, and a large scoured area. All disturbed areas would be revegetated, monitored for exotic species infestations, and the recovery of the site documented.

Numerous gray pines have reached maturity after the construction of the levee, and would have to be removed to excavate the soil underneath. Typically, downed trees and slash would be left on site; however, the extent of slash produced would hamper revegetation efforts. Therefore, all pines greater than 12” diameter or taller than 40’ would be removed from the project site. They would be utilized elsewhere in the park. Those of smaller diameters would be distributed on site [Figure 9].

The roadbed would have to be improved for efficient transport of material. In addition to the limbing of a few roadside oaks, other areas would have to be prepared. A gully that cuts across the road at marker 620 meters would have to be recontoured with a combination of cutting and filling. Second, a detour around the footbridge would be made. The streambed has a reasonable surface once a few small boulders are moved aside, but two large brush patches must be flattened and the streambanks mellowed. This would result in an impact that would have to be restored. Third, a large 5000 lb. boulder sits squarely on the roadbed at marker 320 meters; it can be pushed aside and left resting.

Once the roadbed is removed, the former road areas would be decompacted. Soil would be ripped to a depth of 10” (25 cm) before stored topsoil is redistributed and subsequently revegetated. No specific standards would be established for decompacting and some “field fits” would be necessary once the subsoil is revealed.

The rebuild of the trail footbridge would require a new NW abutment. The existing SE abutment would be reused with minor changes where the span keys into the rock. The NW abutment would be located outside of the bankfull elevation to prevent any constriction and allows for some natural bank deformation. The old NW abutment would be demolished and the rock used in the new structure. Rock would be joined with mortar in the same style as the existing abutment [Figure 10].

The reconstructed trail would avoid the active floodplain where practical. Throughout most of its length, however, it would be relocated within the floodplain and maintain its original alignment. Several steps would be taken to reduce its impact to the vegetation and stream processes. The new trail would not be raised more than 4” (10 cm) above the floodplain. This height should be adequate to prevent puddling, but is low enough to not impede flood flows. Secondly, the width of the trailbed would be limited to 6’(1.8 meters). A narrow trail minimizes the amount of flow acceleration that may occur during high water events. The development footprint is also lessened. Lastly, the alignment of the trail would avoid long straight runs parallel to the creek, be adequately set back from the bank, and would not cross meander bends. These methods would limit or avoid floodplain scour observed in numerous locations due to poor trail alignment.

Until establishment of adequate vegetation, the floodplain would have an unnaturally low hydraulic roughness. To address this issue, short coir (biodegradable coconut fiber) fences would be stretched perpendicular to the flow. Should high flows occur, the fencing would slow velocities and promote deposition in moderate flood events. This fencing would biodegrade after four years when vegetation growth should be dense enough.

To prevent trampling and trail shortcutting, 3’ high barrier fences would be used. This fencing would be constructed of t-stakes with two-stranded wire run between the stakes and synthetic dark green mesh attached to the wires. Fencing would run alongside most trail areas and other areas prone to trampling. These synthetic fences are used throughout PNM and would likely be in place for two to five years. In some locations, tree felled during the project would be used for barriers, minimizing the use of fencing.

Two bank areas would need active restoration and bioengineering. The banks near the footbridge and temporary road and portions of river left bank, which were severely eroded during the 1998 flood [Figure 10]. The prescription for these areas is similar. If the bank has been totally eroded out, a trench would be dug following the desired bank line. Heavy rock exceeding 250 lbs. would be placed between the typical scour depth (approximately 3’ deep) to the streambed surface. Heavy equipment would place the rock utilizing loose rock available at the green rock quarry. Above the rock, coir soil lifts would be used alternating with willow stakes. In areas where the bank is disturbed and devegetated, but still in place, only coir lifts/willows would be used. This hybrid technique is based on recent restoration projects and experimentation in PNM [Figure 11]. It is expected vegetation regrowth and natural bank strength would adequately protect other banks.

Before departing, the heavy equipment would be used to transport bridge materials and bioengineering supplies to the project site. Once the earthmoving is complete and the footbridge completed, park maintenance staff would realign the trail and mark out a rough path. The trail would be reopened and the interpretive signs reinstalled as soon as possible. Bioengineering, replanting, and detailed trail construction could occur coincident with visitor use, which would continue into the winter. All areas directly and indirectly impacted by the project would be restored to high standards.

<u>Phase II:</u>
Phase II lacks the complexity of the first section — having no interfering trail section, a dramatically thinner canopy cover, and more room to maneuver efficient equipment such as scrapers. The 700 meters of abandoned roadbed would be regraded to original ground and removed. Of the 7500 cubic meters of earth removed, 5000 cubic meters would be moved into abandoned quarries and borrow pits and 2500 meters would be removed off site. Filled areas would be compacted and recontoured. A select number of bank areas would be restored including the banks knocked down by equipment and a large scoured area. Once the roadbed is removed, the former road areas would be decompacted. Soil would be ripped to a depth of 10” (25 cm) before stored topsoil is redistributed and subsequently revegetated.

All disturbed areas would be revegetated and the recovery of the site monitored. Just as in Phase I area, a few trees would be removed in order to excavate the soil underneath. As in Phase I, all pines > 12” diameter or taller than 40’ would be removed from the project site and used elsewhere in PNM. Those of smaller diameters would be distributed on site [Figure 8].

Because road removal activity would not contact the active channel, bioengineering is minimized. Most banks are adequately protected by vegetation growth. However, the downstream reach of phase II has a completely degraded bank. The increased height and coarse fill material of the road bed causes a high cut bank where no vegetation can establish. A suitable bioengineering solution for this area would be to bench or notch the bank at a level equivalent to the opposite floodplain [Figure 12]. This would allow a plantable surface where roots could reach the bank toe and reduce the erosion rate. Due to the lack of visitor use in this area (no trail system), this phase would not likely need fencing.

Phase III:
Phase III would remove the riprap lining the dike and drop the roadbed to original ground level on the east side of the levee. Three rock barbs would be constructed in the stream channel to hasten floodplain development and realign the active creek channel to its 1994 course [Figures 13.1, 13.2, and 13.3]. In between the rock barbs, the extensive bioengineering techniques would be used to stabilize the bank [Figures 13.1, 13.2, and 13.3]. While the road bed would be preserved for driving access to the maintenance yard, the elevation of the bed would be decreased 0.5-2.0 meters to make it almost level with the floodplain east of the dike. Only enough roadbed relief to provide drainage would remain. All of the 1500 cubic meters of earth removed would be taken off site.

It is anticipated that the riprap removal and bioengineering portions of this project would commence first and the lowering of the roadbed to ground level would occur during or shortly after the Chalone Housing Development project 1-2 years later. The design of the vegetation allows for this staggered approach to implementation. Due to the lack of visitor use in this area (no trail system), this phase would not likely need fencing to prevent plant trampling. This phase would require the removal a few pines and several live oaks [Figure 9] Small trees would be left on site and large trees removed for use in other areas.

Phase IV:
The restoration area encompassed by Phase IV incorporates approximately 2.3 kilometers of trail [Figure 2]. Of this entire length, 366 meters of trail needs realignment, primarily removing it form the active stream channel and re-establishing it on the floodplain. The reconstructed trail would avoid the active floodplain where practical. Throughout most of its length, however, it would be relocated within the floodplain. Due to the remoteness of this phase's location, the wilderness setting and the constrained work area, no heavy equipment would be used. Work would primarily be done with the use of hand tools (e.g. pulaski, rock bar, shovel) and on occasion a gas powered jack hammer (i.e. poinjar). All work would take place during summer or late fall to avoid sensitive reproductive times for both animals and plants. No work would be conducted in the stream with water present. No fill would be brought in from off-site. Only local materials would be used. This would not preclude visitors from continuing to use the trail. The new sections of trail would be constructed first and opened for public use followed by the old sections then being closed and rehabilitated.

Several steps would be taken to reduce impacts to the vegetation and stream processes. The new trail would not be raised more than 4" (10 cm) above the floodplain. This height should be adequate to prevent puddling, but is low enough to not impede flood flows. Secondly, the width of the trailbed would be limited to 6'(1.8 meters). A narrow trail minimizes the amount of flow acceleration that may occur during high water events. The development footprint is also lessened. Lastly, the alignment of the trail would avoid long straight runs parallel to the creek, be adequately set back from the bank, and would not cross meander bends.

Some sections of trail had small rock walls defining the trail edge along the stream bank. In these areas, the boulders would be removed from the active channel and incorporated in the new trail design. In some cases, the boulders would be left in place as stream habitat, especially if they are associated with step pools or standing water areas. Most of these areas have had natural revegetation with the 1998 flood events. Isolated floodplain areas suffered surface erosion or scour and are now at an elevation below bankfull flow. To correct this non-functioning condition, the trail will be moved away from the creek, the floodplain recountoured, and minimal bioengineering of the surface will restore hydraulic roughness and erosion resistance [Figure 14]. Most areas in Phase IV would not require active revegetation since the natural encroachment of native vegetation would be adequate. To prevent future trampling and trail shortcutting, 3' high barrier fences would be used in some areas. These fences close off the old trail sections to allow vegetation to grow and prevent trampling. These synthetic fences are used throughout PNM and would likely be in place for two to five years. In some locations, tree felled during the project would be used for barriers, minimizing the use of fencing.

Until adequate establishment of vegetation, the floodplain would have an unnaturally low hydraulic roughness. To address this issue, short coir fences would be stretched perpendicular to the flow. Should high flows occur, the fencing would slow velocities and promote deposition in moderate flood events. This fencing would biodegrade after four years when vegetation growth should be dense enough [Figure 14].

Alternatives Considered and Dismissed
In assessing impacts to the stream-floodplain relationship of Chalone Creek, the removal of the Old Pinnacles Trail was considered. This alternative was rejected because of the impact to visitor use of the Balconies Caves, Balconies Cliffs, and North Wilderness areas of PNM. This alternative would yield little environmental benefit over a properly designed and constructed trail system as proposed in Alternative B.

Additionally, an active restoration alternative was originally considered. Active restoration calls for the redesign of the channel-floodplain system to an optimal natural "blueprint". This alternative would have included not only the removal of the stressor but realignment and regrading of the streambed and floodplain. This kind of restoration includes the creation of step-pools, sand bars, and v-weirs to direct water flow. The principle drawbacks to this approach are increased cost the increased disturbance to the riparian woodland (which is still in good ecological condition), and the high level of geomorphic knowledge required. Active restoration has a chance of being more beneficial to the environment, but it also has the chance of being highly destructive. Before a plan could be designed to reconstruct the streambed, a large amount of data and knowledge of the stream system would need to be acquired. We would need an outstanding understanding of the system and how it works to implement active restoration with confidence. We assessed the amount of time and money required to acquire data needed to implement active restoration with confidence and determined that the cost (both in time and money) would be too great. This alternative would push the envelope of our present understanding of the system and have a lower likelihood of meeting enhanced objectives. For these reasons, active restoration was dismissed from consideration.

AFFECTED ENVIRONMENT

Location of Project Site:

Pinnacles National Monument (38° 28′ 25″ N, 121° 11′ 25″ W) is located in central California, approximately 240 km south southeast of San Francisco and 66 km east of Monterey [Figure 1]. PNM is nestled in the Gabilan Mountain Range between the Salinas and San Benito Valleys. The Gabilan Mountain Range is considered part of the inner coast ranges and a small sub-range of the Diablo Range. The climate is Mediterranean (hot, dry summers and cool, wet winters). PNM is approximately 9,712 hectares (24,000 acres), of which 7% is riparian habitat (680 hectares or 1,680 acres).

PNM has two roads that provide access. The West Side is accessed via state route 146 from U.S. Highway 101 either from King City or Soledad. The East Side is accessed via state route 146 from state route 25 either from Hollister, King City, or Coalinga. There is a three-mile gap between the ends of East and West 146, thus there is no connecting road. Travel between the two sides of the Monument is via hiking either up and over the central high peaks (4 miles, 2000 foot elevation gain) or through the Old Pinnacles Trail (3.3 miles, 250 foot elevation gain).

The project site [Figures 2.1 and 2.2] begins at the Chalone Creek Picnic and Housing Area and moves northward along the West Fork of Chalone Creek to the Balconies Cave/Cliffs Trail Junction. The entire project site runs 3 km along Chalone Creek and incorporates approximately 30 hectares (74 acres) of riparian corridor. The Chalone Picnic Area is the secondary use area on the East Side. The primary use area is the Bear Gulch Headquarters Area, approximately 1.5 miles up hill from Chalone Picnic Area. The Old Pinnacles Trail is a medium use trail receiving 3,000-6,000 visitors during a spring month (March, April, or May).

Chalone Creek and Its Floodplain:

Chalone Creek is the principal drainage of the Pinnacles Formation, an uplifted block of erodible volcanics. Flooding of alluvial channels is often dynamic since the bed is more easily mobilized. However, there is evidence that this dynamism exceeds historical ranges. Many of the cut banks were comprised of well-developed soils and fines that have been in place for 1000-10,000 years. Air photos dating back to the 1950's show a trend towards widening channels and loss of riparian cover. Park documents of past flood damage, flood "control" projects that entailed blading of the streambed, and historic ground photos support this trend.

Considering its tectonic setting, rapid increase in stream order (bifurcation ratio), and flashy watershed slopes, finding an analogy or reference stream to Chalone Creek is difficult. However, the visual and quantitative data existing for large flood events in 1983, 1995, and 1998 show an evolutionary trajectory. Geomorphic evidence and large live oak root crowns have been used to track changes in bankfull height, historic floodplain surface, and floodplain/channel relationships. Additionally, some reaches show less dynamism than others, and provide an additional reference comparison.

The Old Pinnacles Road is a raised roadbed running through the Chalone Creek floodplain for 3 kilometers. It acts as a dike, confining overbank flow and the ability of the stream to access its floodplain. Floodplains are not only depositories for sediment load, they dampen the flood peaks, delay the onset of flash flooding, pull pollutants out of the fluvial system, and are ecologically crucial to the semi-arid landscape. Without overbank flow, stream power, flow velocity, shear stress, erosion, and sediment loads are all increased. These increases would damage the riparian corridor by removing vegetation, filling pools, collapsing banks, decreasing thalweg depth, and increasing stream braiding. Each of these effects degrade the habitat of the California red-legged frogs (*Rana aurora draytonii*, CRLF), a federally listed threatened species [Figures 1and 3].

Many of these problems became evident during a 40-year flood event in 1998. In areas where the creek was confined by the road, significant scour and extremely high sediment loads were observed. Erosion monitoring markers, placed 1 meter deep into the streambed, were all scoured out. Downstream of this section, the channel aggraded with massive deposits of sand and gravel, channel sinuosity increased, the channel widened, and significant bank erosion occurred. Without the "pressure relief valve" of the floodplain, this altered stream behavior would continue to occur. The changes in stream behavior are partly to blame for the destruction of a road bridge in 1998, and the subsequent $1.5 million cost

Summary of Environmental Consequences of the Alternatives

Impact Issues	Alternative A – No Action	Alternative B – Restoration
Stream Characteristics and Flooding	Increased flood intensity. Increased stream erosion rates and sediment transport. Continued alteration of natural processes. Short and long-term major impact.	Decreased flood intensity due to floodplain access. Decreased stream erosion rates and sediment transport. Natural process returned. Short-term minor impact. Long-term beneficial impact.
Floodplains and Soils	Reduced sediment deposition onto floodplain and potential risk of soil loss by erosion. Short and long-term moderate impact.	Reduced risk of soil loss by lateral erosion. Increased sediment deposition on floodplain. Moderate short-term impact. Long-term beneficial impact.
Water Quality	Reduced natural filtering mechanisms due to minimized floodplain access. Short and long-term minor impact.	Improves natural filtering. Short-term minor impact. Long-term beneficial impact.
Riparian Vegetation	Continued risk of fragmentation and plant destruction related to flood intensity. Short minor impact. Long-term moderate impact.	1 acre of vegetation disturbed. Short-term minor impact. Long-term beneficial impact.
Special Status Species	Continued risk of habitat destruction by elevated erosion levels. Short and long-term moderate impact.	Short-term destruction of habitat. Short duration of disturbance. Short-term minor impact. Long-term beneficial impact.
Non-native Species	No impact.	Potentially introduced weeds or increased current infestations. Short-term moderate impact. No long-term impact.
Air Quality, Traffic and Noise	No impact.	Short-term, localized increase to air pollution, dust, and noise. Traffic levels moderate short-term impact. Short-term minor to moderate impacts. No long-term impacts.
Visitor Use and Experience	Continued disruption of trail use during periodic flooding. Aesthetic appreciation of riparian ecosystem impacted by continued presence of roadbed. Short and long-term minor impact.	Improved aesthetics and appreciation of restoration efforts. Improved trail access. Short-term disruption in visitor use and experience of area. Short-term moderate impact. Long-term beneficial impact.
Cultural Resources	No impact.	Realignment of some sections of historic road system. Filling two quarries. Short and long-term minor impact.
Wilderness	Approximately 60 acres of land excluded from potential wilderness designation due to roadbed. Short and long-term minor impact.	Approximately 60 acres of land restored and eligible for wilderness designation. Aesthetic impact to visitor experience of wilderness. Short-term minor impact. Long-term beneficial impact.

of rebuilding. The increased channel scour and fill destroyed nearly all of the summer pools required for year-round inhabitation by the CRLF. The rapid channel bank erosion also destroyed much of the vegetation and shelter in the riparian area, reducing the habitat value tremendously. In this section of creek, approximately 100 trees were uprooted from the banks.

The basis for the project and background data is provided by a comprehensive fluvial geomorphology assessment of the Chalone Creek Watershed (Moore, unpublished data). This study combined quantitative measure and geomorphic interpretation, and surveyed the drainage reach by reach [Figures 2 and 15]. This study was initiated during the 1998 flood event, providing insight into high water years, as well as the intervening low water years. Although flow measurements on Chalone Creek have only been available for three years, historical flood damage and rainfall records were used to generate a long-term flood record.

Riparian Habitat:

PNM occupies 9,712 hectares (24,000 acres) of land, of this approximately 7% of which is covered by riparian vegetation (680 hectares, 1680 acres). Dominant riparian species within the project area are cottonwood (*Populus fremontii*), willow (*Salix* sp.), live oak (*Quercus agrifolia*), blue oak (*Quercus douglasii*) and gray pine (*Pinus sabiana*). Adjacent to phase II and III of the project, the riparian habitat has large areas of barren ground. Every major riparian corridor in PNM contains a trail, active road, or inactive road. A comprehensive study of Chalone Creek and it's major tributaries conducted by NPS-Water Resources Division and PNM- Resource Management staff indicates many of the roads and trails are negatively affecting natural fluvial processes which in turn affects the riparian plants (unpublished manuscript on file at PNM). Roads and trails channelize the stream, which increase stream velocities thereby increasing erosion. As the stream velocities increase and the soil erodes away, this undermines riparian vegetation. Ultimately, this cause trees to fall, shrubs to be washed downstream, large areas of ground to be denuded of plant material.

Non-native Plant Species:

Any project that has ground disturbance is likely to be a conduit for non-native plant species. Most invasive non-native plants prefer and thrive in disturbed areas. At this point, monument staff are controlling three non-native plant species (horehound, mustard, and yellow starthistle) in this project site. Disturbance from soil movement is likely to increase the extent and quantity of non-native plant species in the project area. Control efforts are expected to continue for the foreseeable future. These population increases would be expected to last for 3-5 years. These populations are not expected to persist because of our control efforts.

Special Status Species:

Of the 35 potential sensitive species found within or around PNM, 9 species of special concern can be found within the proposed project area: 3 bats, 3 raptors, a turtle, a frog, and an insect.

Three sensitive bat species – Townsend's big-eared bat, pallid bat and western mastiff bat – have been detected within the proposed project area. These bats forage and get water within the area but do not roost here. Bats are most sensitive at their roosts, especially during breeding season (May through August) and winter hibernation (late November through February). Late summer and early fall is when young bats learn to fly and capture food on their own. Each species specializes in foraging in different areas and on different insects – Townsend's close to vegetation, pallid on the ground, and mastiff high in open sky. The population of Townsend's big-eared bats within PNM is stable and may be increasing. The population of western mastiffs within PNM also appears to be stable. Because of their diffuse roosting pattern at Pinnacles, it is unclear how the population of pallid bats is doing within PNM. The disturbance to roosting areas is typically the major impact on bat species. Their food source – insects – is too mobile, adaptable, and unpredictable for construction-type projects to seriously impact, unless a large-scale area was to be developed.

All of three raptor species – Cooper's hawk, sharp-shinned hawk, and long-eared owl – have been detected along this riparian corridor. All are riparian specialists at PNM and use stick nests in oak and pines trees. Cooper's hawks and long-eared owls have been recorded nesting within the proposed project area. None of the trees marked for removal contain nests for these species. For all three species, breeding season runs from early spring (March) through early summer (June), with chicks typically fledged (free flying and no longer in the nest) by mid June. The breeding season is the most sensitive time in a raptor's annual cycle and the most prone for disturbance. Once the chicks are fledged most construction type disturbance is minimal. It is against the Migratory Bird Treaty Act to destroy any migratory bird's nest. Both the Cooper's hawks and sharp-shinned hawks are migratory and protected by this legislation. The population of Cooper's hawks (approximately 6 pairs), sharp-shinned hawks (approximately 1 pair) and long-eared owls (from zero to three pair depending upon the rain) is relatively low, which makes each more valuable.

The southwestern pond turtle is a riparian reptile. It resides in PNM in very low numbers. Because of the kind of habitat within the proposed project area, this species is expected to not reside there, but likely move through the area between the good habitat that is above and below the project site. There have been numerous sightings of pond turtles within 0.5 km upstream of the project area.

The California red-legged frog (CRLF) is a federally listed threatened species and there is designated critical habitat within PNM. CRLF populations were once robust (up to 1994) within PNM in fact they were considered to be one of the most abundant frog species (in the 1950's). When surveyed in 1998, virtually no CRLF were located. It is believed that two close flood events (1995 and 1998) along with the introduction of an exotic fish significantly reduced the frog population. CRLF have not been located within any of the project sites for the last 5 years, although historically CRLF were found in phases I and IV. There is a small population of CRLF just downstream of the project site. It has been hypothesized that the lack of good habitat – vegetative cover and standing pools of water – just above this population is a barrier to CRLF dispersal up stream. Within the CRLF annual cycle, the most sensitive times are April though September, when the eggs are laid through the tadpoles metamorphosing into frogs. The most sensitive areas would be deep pools of standing water, where CRLF can hide from predators in the depths of the water and there is enough water for the tadpoles to metamorphose. Within the proposed project area, there are no pools of water, in fact in most of the project site, the stream dries completely from June through January. Starting in late August through the following spring, CRLF metamorphs might move through the project site. However, this would only be an issue if eggs and tadpoles were found near the road bridge to Bear Gulch Headquarters or at Willow Springs. Current breeding areas (in South Wilderness) are too remote for metamorphs to arrive in the project site. At this point, there is no good habitat within the proposed project areas (phase I, II or III). There is decent habitat within the phase IV of the proposed project, but for the past 5 years there have been no CRLF located within this zone.

The Pinnacles Riffle Beetle (family Elmidae) is an aquatic insect restricted to living in riffle sections of streams. This species requires the presence of water and moves out of areas in drought years. Eggs are laid in water and larvae hatch. For the larva to transition to adult form, the larva creates a terrestrial pupal chamber that overwinters and presumably hatches as an adult the following spring. The project site is where the holotype of this species was collected. Within the project phases I, II, and III, there are 46 riffle sections totaling 676 m potential habitat. It is estimated that this area represents approximately 5% of the riffle habitat in Chalone Creek and its tributaries. Phase IV will not be within riffle beetle habitat.

Historic Cultural Resources:

The early origins of the Old Pinnacles Road are unclear, although a 1929 map of PNM shows roads accessing either side of the Balconies area. The road on the Western Side of the Monument provided access from the Soledad area. The road on the East Side of the followed the western side of Chalone Creek up to the Marcott's Spring (Willow Spring) area. The road entering the Monument from the east, along Chalone Creek, provided access for travelers and local residents in the Hollister area. A trail connected the one road to the other through the Balconies section of PNM.

The access to Marcott's Spring area, as shown on the 1929 map was from a road that crisscrossed Chalone Creek. The majority of road along the upper end of Chalone Creek is located on the western side of the stream. The CCC began construction of a new road, referred to as the "truck road/trail" in construction reports, that extended along the east side (in lieu of the older one along the west side) of the valley up towards Marcott's Spring. Begun in April of 1934, grading was practically completed from the entrance road to the Chalone area by May. Beyond the Chalone area, grading continued and extended to the "upper end of the valley". The construction of road resulted in the creation of cuts and fills, many of which extended into Chalone Creek. Monthly construction reports indicate that the work "has progressed too far for revisions which would reduce height of cuts, the cuts having already been shot." Monthly construction reports also note that the road berm in the Chalone area was constructed to about seven feet in height, was visually intrusive and was not consistent with typical efforts to make the road blend into the landscape. In these monthly reports, Thomas E. Carpenter, NPS Landscape Architect, expressed dismay at the road fill grade opposite the CCC camp stating that it "is quite artificial looking in respect to the natural landscape." (Report, Carpenter to Chief Architect, April 17,1934:2)

The construction of the road along Chalone Creek was clearly not to the same design standards as the main entrance road into PNM. Little masonry work is evident, there is no documentation that it was ever paved with macadam, and it was not built with the same consideration for aesthetics as the road into Bear Gulch.

The construction of the roads within PNM made use of rock and gravel mined from numerous sites within this area. Smaller borrow pits appear to have been reclaimed: "During the improvement of this truck trail, there have been several borrow pits that have been opened for needed material. It is recommended that these small areas be landscaped and returned as much as possible, to their original appearance." (Report to the Chief Architect through the Custodian of Pinnacles National Monument by Frances G. Lange, Assistant Landscape Architect, March 18 1936.) However, two quarries dating to this period still remain along the road. One quarry, referred to as the Blue Quarry, provided fill material for the road with material extending up into the Balconies area according to park staff. The Green Quarry provided building material for work being completed up in the headquarters area as well as providing fill material for road and trail construction.

By May of 1934, grading to Camp Pinnacles (currently the Chalone Picnic Area) was nearly complete and it is noted in the monthly reports to the Chief Architect that a narrow road had been constructed to the upper end of the valley leading towards Old Pinnacles. A proposal to connect the roads from the east and west sides of the Monument was cancelled when park staff realized that such a road "...will be so detrimental to the natural and scenic values of the Pinnacles…" (Memo, Waterhouse to Regional Director, January 24, 1938:1)

Park staff indicate that visitors used the CCC-constructed road to access the Balconies from the east side of the Monument until 1968/69, at which the NPS stopped public vehicular access. Park vehicle access to the Balconies continued along this road until access was eliminated by the flood of 1973/74, at which point the damaged road was not repaired to re-establish vehicular access. Subsequent floods in 1981, 1983, 1993, 1995 and the most recent one 1998 have caused extensive damage to those portions of the road/trail system within the flood plain.

Today it is unclear exactly which sections of the road within the flood plain retain historic fabric and alignment. Portions of the Old Pinnacles Trail were constructed within the floodplain of Chalone Creek. Consequently, numerous portions of the trail have washed out over time requiring that the trail be rebuilt or repaired in a variety of locations over the years. Today, the integrity of the road/trail sections that exist within the floodplains have been compromised through loss of historic materials and it is unclear which portions of the trail within the flood plain actually retain their original alignment or historic materials. In particular, the dike adjacent to the Chalone picnic area has been damaged extensively over time and is presently armored with rip-rap boulders placed subsequent to the 1998 flood event.

Wilderness:

Legislation in 1978 created a 12,952-acre wilderness and 325 acres of potential wilderness within PNM. In January 2000, approximately 8,000 acres of Bureau of Land Management lands were transferred to the NPS. In these lands were approximately 2,250 acres of Wilderness Study Areas, land that must be managed as if it were designated wilderness. Alternative B would include some work within designated wilderness.

Wilderness plays a role in the overall health of ecosystems, providing untrammeled habitats for wildlife and plants. Wilderness typically possesses the following characters. First, it is a place that the earth and its species are free from man, where man is a visitor who does not remain. Second, it has a primeval character without permanent improvements or human habitation. It appears to be affected primarily by the forces of nature, where man's imprint is substantially unnoticed. It allows for opportunities of solitude and a primitive type of recreation. Lastly, wilderness is managed to preserve its natural condition.

Management of this wilderness must preserve its wilderness character and must allow for visitor enjoyment of it. There are six specified purposes of wilderness: recreation, scenic, scientific, education, conservation, and historical use. Land managers are allowed to approve and implement activities in wilderness provided that the activities further one or more of the purposes of wilderness. Before an action can be implemented in the wilderness, the action must be analyzed following a protocol called the Minimum Requirement. This protocol establishes a set of questions in a must be answered to help land managers determine if a proposed action is acceptable in wilderness and if the action is the minimum needed to achieve the goal (Appendix 1). Active stream restoration was assessed and the project was deemed to meet the purposes of wilderness because it is related to the conservation of wilderness (Minimum Requirement Document, on file at PNM). Additionally, the proposed project also furthers the scientific purpose, by increasing our understanding of the ecosystem and how the stream, floodplain, and vegetation relate to each other. The Wilderness Act intended, and NPS policy provides for, the conduct of natural scientific uses of wilderness areas. Scientific activities are to be encouraged in wilderness, provided the benefits outweigh the impacts on other wilderness values (Director's Order 41: Wilderness Preservation and Management, NPS 1999). The proposed project would enhance the recreation and scenic aspects of wilderness by restoring portions of the wilderness and decreasing large flood events which close sections of PNM while it is repaired. NPS units with wilderness resources will operate public education programs designed to promote and perpetuate public awareness of, and appreciation for, wilderness character, resources and ethics. (NPS Management Policies) The educational signs associated with this restoration program would include discussions on wilderness resources and character. Because PNM would also implement these educational signs and handouts associated with the restoration, the educational purpose of wilderness would also be incorporated.

Once it was determined that a stream restoration project met the purposes of wilderness, how the project would be implemented on the land needed to be determined. Section 4(c) of the Wilderness act states " except as necessary to meet the minimum requirement for the administration of the area for the purpose of this Act … there shall be no temporary roads, no use of motor vehicles, motorized equipment or motor boats, no landing of air craft, no other form of mechanical transport and no structure or installation within any such area." Wilderness managers may authorize the generally prohibited activities or uses listed in section 4(c) of the Wilderness Act, if they are deemed necessary to meet the minimum requirements for the administration of the area as wilderness and where those methods are determined to be the minimum tool for the project. When assessing the an action, the potential disruption of wilderness character and resources are be considered before, and given significantly more weight than, economic efficiency and convenience. If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have localized short-term impacts will be acceptable (NPS Management Policies).

Connected, Cumulative, and Similar Actions:

Most developed areas in Pinnacles National Monument were constructed before the National Environmental Policy Act was passed in 1969. Primary developed areas – Bear Gulch Headquarters, Chaparral Ranger District, the Moses' Springs Parking Area, Condor Gulch, Chalone Housing, Picnic, and Maintenance Area, and most of the roads connecting these areas – are in the valley bottoms. These areas were developed presumably because construction on the relatively flat ground is substantially less expensive than construction on steep terrain. Due to the narrow valleys and the steep hill slopes, most developed areas in PNM are on floodplains or in some cases the active stream channels. Each developed area caused constriction or impedance to natural fluvial processes. Efforts to control natural process, such as building culverts, rock walls, drainage channels, and levees, have not only been marginally successful from an engineering perspective, but have negatively impacted the natural systems. These impacts are not only localized, but have contributed to a major cumulative impact upon the stream system. Even though hydrologic studies at PNM have only begun recently, there are indicators that channel widening; wildly fluctuating sediment loads, and braiding illustrate this cumulative effect. Chalone and Bear Creeks are not fully functioning or healthy primarily due to the first 60 years of development in the Monument.

Pinnacles National Monument is attempting to reduce this cumulative effect by implementing restoration projects to correct past mistakes. Restoration began in 1968, when flooding destroyed the Old Pinnacles Campground (near Balconies). The decision to not rebuild this facility allowed passive restoration of the area to begin. Similarly in 1982, when the Chalone Campground flooding for the third time, it also was not rebuilt and the area was restored to natural conditions. This restoration was completed in 1997, when the last building was finally removed. The 1998 flood again dramatically changed the park landscape. During this 40-year flood event, the Chaparral Campground was destroyed (for the third time in 20 years), the parking lot at the Chaparral Ranger Station was damaged, the Overflow Parking Lot and maintenance facility in the YACC area was damaged (for the second time in 5 years), and the abandoned landfill in the YACC area was unearthed. The continued pattern of damage to facilities is testament to the conflict between natural process and park management. In response, some areas, such as the Chaparral Campground, have been allowed to return to natural condition. Others, such as the Chaparral parking lot, have been modified to continue their utility but minimize their impact to the natural environment. The park narrowly avoided severe environmental consequences when the YACC landfill and overflow parking area was eroded, exposing toxic levels of several heavy metals and scattering trash downstream. In this case, the link between park facilities and damage to the environment was clear and alarming. This site negatively affected Chalone Creek for several miles downstream, and the entire site required active restoration. The YACC landfill restoration is 2 km (1.3 miles) downstream of the lower limit of proposed project. Some of the techniques and lessons learned there in the previous three years would be applied to the proposed preferred alternative B Chalone Creek restoration.

Each phase of alternative B was originally envisioned as separate projects. However, the cumulative effect of manipulating Chalone Creek and the need for a comprehensive restoration approach lead us to consider them together in a single document. The proposed project is integrally connected to previous projects – both development and restoration projects. Park managers recognize Chalone Creek is in a precarious state. Certainly, restoration should continue incrementally to reduce the cumulative effects of past actions. With each restoration action, the natural system should become more resilient and better able to cope with natural disturbance and short-term impacts associated with restoration actions, visitor use, or other construction projects. This project would attempt to repair the current damage from past actions, minimize future damage, and further the recovery of the system that previous restoration projects have begun.

This proposed action should also be framed in the context of future actions. Management decisions over the past 90 years have had a major cumulative effect on streams and floodplains. Consequently, several restoration projects have been envisioned to reduce or eliminate the current major impacts to the Monument's stream systems. Other proposed restoration actions include the restoration of Bear Gulch around the Moses Springs and Visitor Center parking areas, the restoration of Condor Gulch, the removal or upgrading of several culverts throughout the watershed, and the removal of the Chaparral facilities. Each of these restoration projects will be investigated for their feasibility and restorative benefits and potentially implemented over the next 20 years. With the build-out of the Chalone Housing Area and Chalone Maintenance Yard slated for Fall 2002, the Chalone Picnic Area and Parking Lot would be destroyed. Future development actions being considered include the relocation of the Chalone Picnic Area, and additional parking facilities to replace damaged or lost parking lots. Given the past actions and better insights into natural stream systems park management will have to carefully consider and design these facilities to avoid adding to the existing cumulative impact. However, the formulation of these replacement facilities is too young for even close approximation of the effects to be considered here. Impacts of these potential future actions would be thoroughly discussed when detailed plans are available. No projects outside the Monument were considered as connected because the majority of the Chalone Watershed is within PNM.

ENVIRONMENTAL CONSEQUENCES

The following section identifies the environmental impacts associated with the proposed alternatives. Associated with each impact issue, there is a classification of the impact. No impact implies the alternative would not have any measurable effect to the identified resource. Negligible impact implies the alternative would have an effect that could be measured but would not have any meaningful effect on the resource. An example of a negligible impact would be trimming a few branches off a tree. Minor impacts can be measured and are meaningful, but are small in scale, both in time and area. Typically, small time scales would be less than 4 weeks. A small area would be less than 10 acres or less than 10% of the resource, if that resource occupies less than 10 acres within the monument. There is also the understanding that while minor impacts are of short duration and small scope, the timing and placement does not overlap sensitive times (e.g. breeding season for an animal or times of water flow for streams) or sensitive places (e.g. nest area or wetland). Moderate impacts begin to affect larger processes and are typically larger in scale, either in time (up to 4 years) and/or in space (10 to 100 acres or 10 to 30% of the resource) or affect sensitive times. Major impacts affect the larger processes, have a large scale (more than 100 acres or 31% of the resource) and last for a long time (more than 4 years after the project is complete) and overlap sensitive aspects for the resource. Impacts are classified as impairment if in the long-term the action would prevent the process from behaving naturally and would lead to degradation of the resource under evaluation. The Organic Act of 1916 prohibits the National Park Service from implementing any action that causes impairment.

Impacts are identified on two time scales – short and long term. Short-term impacts essentially occur during the active portion of the alternative (e.g. during the construction period). Short-term impacts are either self eliminating (e.g. there is no dust created as soon as construction is completed) or can be corrected shortly there after by mitigation (e.g. trees were removed for construction, but replacement trees were planted and would restore the area in the long-term). Long-term impacts typically begin once the active project is complete (e.g. the construction of a new parking lot would in the long-term increase visitor use). Long-term impacts continue past the active portion of the alternative for at least the foreseeable future, 15-20 years, and potentially longer. If the alternative established an activity that would continue for the foreseeable future (e.g. the creation of a permit system), then the impacts of the active portion would be considered in long-term impacts as well as short-term impacts.

Alternative A

Alternative A is the no action alternative.

Stream Characteristics and Flooding: Because the stream is confined and not allowed to access the floodplain, increased erosion rates would be expected as well as increased sediment transport. The confinement causes increase flow rates that in turn have increased capacity to carry sand, cobbles and rock downstream. Because of insufficient access to floodplains, there would be increased flood intensities. Currently, the entire floodplain can only be accessed during extreme flood events larger than 50-200 year events. The primary means of decreasing flood intensities is to allow broader access to floodplains, which spreads the water, decreases flow rates and minimizes the stream's capacity to do extensive damage. The streambed would likely have large mobilization events associated with floods that in turn would destabilize riparian form, function and vegetation. The stream would continue to have large fluctuations in erosion and deposition. There would be a continued alteration of the natural fluvial processes. This would have short term as well as long tem major impacts to the stream and its function. It is likely that this could lead to impairment of our riparian ecosystems. This would continue the cumulative effects of previous projects as described in the Affected Environment.

Floodplains and Soils: Because the stream is confined and not allowed to access the floodplain, there would be an increased risk of lateral erosion as the stream removes banks and the associated soil. Considering how limited the soil resource is at PNM (there are very few well-developed soil areas), the riparian corridors and floodplains are important for plants needing deep soil. Because of lack of access, the stream would not deposit sediment onto the floodplain. Deposition is an integral component of floodplains; without this action, the floodplains would not function "normally". The disconnection of the stream to its floodplain would have a direct affect on the fluvial process. Because of the spatial scale of this project and the fact that Chalone Creek does have access to floodplains both upstream and down stream from this site, this would be a moderate impact (instead of a major impact). This would continue the cumulative effects of previous projects as described in the Affected Environment. Provided Chalone Creek maintained connectivity to its other floodplains, this alternative would not lead to impairment.

Water Quality: Floodplains force stream water to slow. In the process of losing its velocity, the stream no longer carries sediment. Consequently, when access to floodplains are denied, the water quality of a stream decreases because the stream's velocity stays elevated and the stream continues to carry high sediment loads. High nutrient levels, which can be a significant pollutant, are normally high during runoff events; without contact between the water and floodplain surface, there is little opportunity for these nutrients to be removed from the system. Instead, they concentrate in surface waters along with other unwanted pollutants such as coliform bacteria. The no action alternative does not restore the stream-floodplain connection and would thereby reduce the natural filtration that occurs when water slows. This would continue the cumulative effects of previous projects as described in the Affected Environment. While this is a measurable effect, it must be recognized that Chalone Creek is a high sediment creek naturally. It would be difficult to identify how much sediment is from channelization and limited access to floodplains and how much sediment is attributed to the streambed characteristics. Therefore, this alternative would have a minor short-term and long-term impact on water quality and would not likely lead to impairment.

Riparian Vegetation: Without access to floodplains, the stream would likely continue to have increased flood intensities. As flood intensity increases, the stream has more force in its water and is more likely to destroy riparian vegetation and erode banks. The lifecycle of streamside vegetation and the vegetation community succession are closely linked to stream processes. The dynamic nature of Chalone Creek results in a localized disturbance, fragmentation, and small scale destruction of riparian vegetation. Data and observations from the 1995 and 1998 floods clearly depicted large areas of tree loss and denuding of the habitat. Other areas show encroachment of upland vegetation into the former riparian area due to lack of flooding. Because of the dynamic nature of this vegetation community, its tolerance for disturbance, and its ecological resilience, it is difficult to assess how much change can be attributed to non-natural stresses. However, because the majority of biodiversity at Pinnacles National Monument is related to the riparian vegetation that covers only 7% of the Monument area, impacts are of heightened concern. It is expected that the no action alternative would cause moderate short and long-term impacts. This alternative has the potential to lead to impairment. This would continue the cumulative effects of previous projects as described in the Affected Environment.

Species of Special Concern: There are 9 species of special concern within the project area: 3 bats, 3 raptors, a turtle, a frog and an insect.

Bats: All of these species have been detected along this riparian corridor. The bats forage and get water within the area. However, all three of these species roost in rocks or caves and do not roost in trees. There is no effect anticipated on bat species from the no action alternative.

Raptors: All of these species have been detected along this riparian corridor. All three species are riparian specialist at Pinnacles and long-eared owls have been recorded nesting within the area. No effect would be anticipated on raptor species from the no action alternative.

The southwestern pond turtle has very low numbers in PNM. Because of the lack of stream form (no pools) and minimal vegetative cover, the turtle is not expected to reside in the area, but likely moves through these areas between the good habitat that is above and below the project site. With the continued effect to proper stream function and effects to riparian vegetation, the no action alternative is likely to have minor long-term effects on the pond turtle, through decreased habitat value associated with frequent flood events resulting in loss or degradation of habitat.

The California red-legged frog (CRLF) and its designated critical habitat within PNM would likely be affected by the no action alternative. With the extensive scour associated with the 1998 flood, several prime CRLF plunge pools were filled with sediment downstream of the proposed project site. Park biologists actually documented areas of previous CRLF activity no longer having the species. Because of the increased erosion rates, the No Action Alternative would be expected to continue to affect downstream CRLF habitat. Plunge pools need to be more than 0.7 meter deep for the pool to provide the frog protection from predators as well as enough water for the tadpoles to make it through metamorphosis. While the scale may be small, only impacting a few pools with each flood, it is expected to be a cumulative effect over the years. The expected increased sedimentation rates would be associated with an increase risk of habitat destruction, habitat that is vital for breeding. Therefore, it is expected that the no action alternative would have moderate impacts for the short and long-term on special status species and could lead to impairment of this resource.

The Pinnacles riffle beetle is not likely to be affected by the no action alternative. This species is dependent upon riffles, which typically are not threatened by sedimentation the way pools are. Therefore, it is expected that the no action alternative would have no short or long-term effects on this resource. There would be no cumulative effects associated with this alternative on species of special concern.

Non-native Species: This alternative would have no impact associated with non-native species.

Air Quality, Traffic, Noise: This alternative would have no impact associated with air quality, traffic and noise.

Visitation and Visitor Experience: Due to the propensity for intense flooding, there would be a continued disruption of the visitor use of the trail system along Chalone Creek. Typically flooding events limit trail access for 2-4 weeks, sometimes longer, if damage were substantial and major trail repair would be needed. Additionally, due to the flood scouring and disruption of riparian vegetation, there is a measurable impact to the aesthetic quality of the Chalone Creek riparian corridor. It is expected to continue to look impacted because of the roadbed presence and minimized vegetative cover. Therefore, the no action alternative is expected to have minor impacts to visitor experience for the short and long term and is not expected to lead to impairment,

Cultural Resources: This alternative would have no impact associated with cultural resource issues.

Wilderness: The no action alternative would prevent approximately 60 acres of land from being considered for wilderness designation. This area was denied wilderness designation in 1978 because of the Old Pinnacles Road. Due to the continued existence of the roadbed in the no action alternative, there would be a minor impact in the short and long term and would not like lead to impairment. There would be no cumulative effects associated with this alternative on wilderness.

Alternative B

This alternative restores 3 km of Chalone Creek by removing the roadbed and reconnecting the stream to the floodplain.

Stream Characteristics and Flooding: This alternative would restore natural stream characteristics and floodplain function in several critical areas along Chalone Creek. These functions would be similar to pre-disturbance conditions (pre-1930's). Processes changed would include increased access to floodplain, genesis of new floodplain areas, increased roughness and reduced water velocities across floodplain surfaces, and broader flood hydrographs (longer flood duration) with reduced peak floods (lower flood heights). Subsequent changes include decrease in erosion in the project site, increased deposition at the project site, and lower sediment transport rates at and downstream of the project site. Incision of the stream channel (deepening of the streambed) would be reduced or halted, allowing the streambed to access its historic floodplain at a reasonable frequency. The magnitude and character of these changed processes would be restorative, as they are similar to natural and pre-disturbance conditions that we believe existed before significant stream alterations were made between 1930 and 1975. There would be a long-term benefit to the natural environment with this alternative. A minor short-term impact to stream characteristics would be expected for the winter season after construction, as ground disturbance would temporarily weaken banks and streambeds in isolated areas. While low stream flows would contribute little to channel change, higher flows and floods would exploit weakened banks resulting in an unnatural stream alteration and erosion. The likelihood of this is small (approximately a 20% chance), and the impacts would only be observed in isolated areas of the project site the winter following construction. To minimize the likelihood of unnatural channel change, bioengineering techniques would be used to stabilize banks in the most affected areas. There would be no negative impacts from flooding and negligible impact from flooding damage; and the benefits would be immediately realized with no short-term problems. This alternative is not likely to impair stream resources. This would reduce the current cumulative effects from past projects and would not add any new negative cumulative effects on the streams.

Phase I and Phase II would remove significant portions of roadbed, resulting in the ability of the stream to access its historic floodplain. The primary benefit would be the reduction in flood intensities at and below the project site, with secondary benefits including normalized sediment transport, increased channel roughness at high flows, reduced flood peaks, and a more natural geomorphic setting. Specific impacts include temporary reduction in streambed and bank strength, which could result in isolated minor impacts.

Phase III would remove a rip-rap embankment and replace it with rock barbs (bend-way weirs) and vegetation. The barbs would lower water velocities close to the stream bank and subsequently reduce sediment transport. This would result in the formation of a floodplain in a stream section currently without one. The dike and roadbed adjacent to the rip-rap bank would be lowered to near the original ground level. This dike protects a stream terrace that is not expected to be inundated by Chalone Creek except in extreme events. The removal of the dike and lowering of the road would reduce the likelihood of ponding behind it during high runoff. Ponding would be expected to occur during moderate rainfall events, and is probably a greater hazard to facilities than stream flooding. Flood heights and duration would be amplified locally, but due to the other phases of the project a negligible increase in flood damage is expected. Specific impacts include temporary reduction in streambed and bank strength which could result in localized minor impacts to stream characteristics.

Phase IV would relocate several segments of trail further away from the stream channel, regrade the floodplain back to its natural proper elevation, and introduce a riparian buffer between the stream channel and trail. This would increase floodplain roughness to a natural degree in these locations, decrease bank erosion and decrease floodplain scour. Specific impacts include temporary reduction in streambed and bank strength, which could result in isolated minor impacts.

Floodplains and Soils: This alternative would increase the ability of the stream to access its floodplain. The historic floodplain would likely be accessed during 5-10 year events and larger. Currently, the entire floodplain can only be accessed during extreme flood events larger than 50-200 year events. By spreading out floodwaters over a larger area, and utilizing the greater hydraulic roughness of the vegetated floodplain surface, the floodplain would function naturally. In this functioning condition, a portion of floodwaters would be temporarily stored on the floodplain, resulting in less severe floods. Other floodplain functions would also be restored, including the increased ability to improve water quality, increased ability to recharge groundwater, increased ability to exchange nutrients between the soil and surface waters, and an increased ability to build rich soils. Currently, soil development is being thwarted by two mechanisms. Without fresh deposition of stream sediments, the unique character of floodplain soils is limited. Secondly, increased flood water velocities in the central channel is causing lateral erosion of the banks and floodplains. This alternative would restore proper soil development on the floodplain surface, while reducing the likelihood of lateral erosion and soil loss. Immediately after construction, and during the following winter, the disturbed floodplain surface and soils would be more vulnerable to erosion. If a moderate or larger flood were to occur during the first year after construction (approximately a 10% chance), then there would be an impact due to erosion and soil loss. However, the likelihood of this is small, and arrays of biodegradable silt fences would be installed in vulnerable locations to mitigate this potential. Because of the short duration of this vulnerability and the small chance of flood occurrence, this is a minor risk of a moderate impact. This alternative is not likely to impair floodplains or soils. This would reduce the current cumulative effects from past projects and would not add any new negative cumulative effects on the floodplains or soils.

Phase I and Phase II would protect floodplain function and soils by removing the raised roadbed that prevents floodplain access. This would allow proper functioning condition along 0.7 miles of stream, significantly improving the beneficial aspects of floodplain inundation and promoting proper soil development over several acres. Soil disturbance would be mostly limited to historic fill soils of little natural resource value, but cleared areas would be more prone to erosion during the winter following construction. If flooding were to occur in the winter following construction, some areas would have erosion of the floodplain surface and soil loss. In the erosion-prone areas, control measures such as biodegradable silt fences would mitigate the problem. These would be effective in moderate floods, but would not be effective in large events. Once vegetation is established, ground settles, and organic material accumulates on the floodplain surface, its erosion resistance increases markedly. Therefore, the risk of floodplain or soil loss is minimized to the extent practical and the long-term benefits are major.

Phase III would enhance floodplain function by constructing rock barbs (bend-way weirs) and establishing vegetation on the bank of an existing rip-rap dike. Both of these elements should initiate a floodplain formation on a 150-yard section of stream. Although small in size, this floodplain would eventually stabilize the stream in this location, provide the appropriate foundation for riparian vegetation, and begin the slow process of soil development. The benefit of this small area is made more significant by the lack of floodplains along this reach. There would be no risk to floodplains or floodplain soils, since none currently exist here, and therefore this phase has no negative effect on floodplains or soils and would provide a beneficial impact.

Phase IV would protect floodplain function and soils by moving the trail bed laterally away from the Chalone Creek in certain locations, and by re-introducing a natural vegetated buffer strip between the trail and the stream. Because the individual work sites within this phase are small and dispersed, benefits would be minor and impacts would be negligible.

<u>Water Quality</u>: Improved floodplain access would benefit water quality. Lower stream velocities and longer residence times in contact with the floodplain would result in reduced sediment load, increased uptake and sequestering of nutrients (such as nitrates and phosphates), and opportunities for natural filtering. Because of the amount ground disturbance associated with restoration and construction, there would be a minor short-term impact to water quality due to increased fine sediment (silt and sand) during flooding or rainy periods. Because most of the disturbed area is on flat ground, and only high runoff events would be likely to deliver the sediment to the stream, this is not likely to cause impairment to the stream or sensitive species living downstream.

Every phase of the project would improve floodplain access or floodplain formation. This would result in improved water quality, especially during high flows on Chalone Creek. Each has a ground disturbance component that could potentially increase delivery of fine sediment to the stream, but because of the short duration of this vulnerability and the topography, this would be a short-term minor impact. This would reduce the current cumulative effects from past projects and would not add any new negative cumulative effects on water quality.

<u>Riparian Vegetation</u>: Improving Chalone Creek's floodplain access would restore the natural processes that maintain a healthy riparian vegetation community. An appropriate degree of disturbance, inundation, nutrient exchange, and sediment would allow for healthy and natural streamside vegetation community. The restoration of floodplain access and floodplain process would reduce the encroachment of upland vegetation into the riparian vegetation community, promote natural succession, and increase community complexity by small (not large) disturbances. This would result in a long-term benefit. The restoration process and construction would require removal of several trees and shrubs. While the entire project (all phases combined) is within a 3 km, 100 m wide swath of riparian vegetation (30 hectares, 74 acres), only 2.7 hectares (6.5 acres) would have actual ground disturbance or vegetation removal. Trail bed or roadbed currently disturbs most of this 2.7 hectares (6.5 acres). Thus, the actual ground disturbance

associated with all 4 phases of Alternative B would be 0.4% of the total riparian habitat within PNM. Plant species that are restricted to the riparian zone would be specifically identified and protected during construction when possible. Trees established before the construction of the roadbed and dike in the 1930s would also be specifically protected. Additional mitigation would result from an extensive revegetation effort. Plant species would originate from the project site and be distributed in number and location to mimic the native community. Because the project area is in the riparian zone, natural water sources are close by which should improve the restoration by increasing vegetation survival rates. (Typically, water is the limiting resource and upland revegetation area experience a 50-75% plant mortality rate due to water stress.) The total vegetated area would be increased with this alternative. Therefore, vegetation impacts would be short-term and minor. This alternative would not impair riparian vegetation. This would reduce the current cumulative effects from past projects and would not add any new negative cumulative effects on riparian vegetation.

Phase I would result in a long-term benefit to the riparian vegetation community. During restoration activities, 35 gray pines and one red willow (*Salix laevigata*) would be cut. All of these trees are estimated to be less than 40 years in age. Gray pines are primarily an upland species, but often grow in riparian areas where disturbed or particularly dry. 12 coast live oaks and red willows would be trimmed back for equipment clearances. Also, several shrub patches (poison oak, buckbrush, buckwheat, wild rose, etc) would be removed. These removed individual plants would be replaced through a combination of revegetation and natural encroachment of existing vegetation.

Phase II would result in a long-term benefit to the riparian vegetation community. During restoration activities, 8 gray pines and one toyon (*Heteromeles arbutifolia*) would be cut. All of these trees are estimated to be less than 40 years in age. Five coast live oaks, one gray pine and one red willow would be trimmed back for equipment clearances. Also, several shrub patches (poison oak, buckbrush, buckwheat, wild rose, etc) would be removed. These removed individual plants would be replaced through a combination of revegetation and natural encroachment of existing vegetation.

Phase III would result in a long-term benefit to the riparian vegetation community. During restoration activities, 6 gray pines and 8 live oaks would be cut and left on site and 8 live oaks would be cut and removed. All of these trees are estimated to be less than 70 years in age. A few patches of buckwheat and several exotic weed species would also be removed. Because this area has been heavily impacted for decades, significantly greater numbers and more diverse vegetation would be replanted in this area. An assortment of plants representing riparian and transitional communities would be replanted, including sandbar willow (*Salix exigua*), arroyo willow (*Salix lasidepis*), red willow, and cottonwood close to the stream. Further from the stream, live oak, elderberry (*Sambucus mexicanus*), coyote bush (*Baccharus pilularis*), wild rose (*Rosa californica*), blackberry (*Rubus ursinus*), chamise (*Adenostoma fasciculatum*), buck brush (*Ceanothus cuneatus*), and manzanita (*Arctostaphylus glauca*) would be planted.

Phase IV would result in a long-term benefit to the riparian vegetation community. During restoration activities a few shrub patches, small saplings and small trees would be removed. All of these trees are estimated to be less than 20 years in age. Impacted areas would be revegetated through planting or natural encroachment of existing vegetation. The former trail bed would be revegetated with appropriate species mimicking the native vegetation community.

<u>Species of Special Concern</u>: There are 9 species of special concern within the project area: 3 bats, 3 raptors, a turtle, a frog and an insect.

Bats: All of these species have been detected along this riparian corridor. The bats forage and get water within the area, but do not roost in trees. Late summer and early Fall is when young bats are learning to fly and capture food on their own. It is expected that the vegetation disturbance associated with phase I and II would have negligible impacts on bat species. A slight decrease in insect activity in the construction area could affect bat foraging, but the impact would be a small area and for a short time. Phase III currently has limited bat foraging activity and it would be expected to have no effect on bats. Likewise, phase IV is not expected to affect bats due to the small size of its disturbance and the maintenance of riparian vegetation in the project zone.

Raptors: All of these species have been detected along this riparian corridor. All are riparian specialists at PNM. Cooper's hawks and long-eared owls have been recorded nesting within the phase IV area. All phases of Alternative B would occur in late summer, after chicks had left the nest. Trees identified for trimming or removal do not contain raptor nests. Cooper's hawks and sharp-shinned hawks do forage in all four phases of this alternative. It would be expected that during construction times, machinery, human presence, and construction noise would disrupt foraging. The area of each phase is small, the duration of each phase is short (less than 4 weeks), and each phase would be implemented in different years. A minor effect would be anticipated on raptor species from Alternative B.

The southwestern pond turtle exists in very low numbers at PNM. Because of the lack of habitat in phase I, II, and III areas, it is not expected to reside there, but might move through these areas between the good habitat that is above and below the project site. Approximately 10 to 20 meters from the construction areas in Phase IV, there is good turtle habitat– both in vegetative cover and step-pools within the stream. But no heavy equipment will be used in Phase IV, so little to no impact is expected. It is possible that construction activity would affect pond turtles, however this disruption would be for short duration. Sightings of pond turtles are primarily above the project area, with only one instance of a turtle being seen within the project area over the past 10 years. Phase I, II, and III would create improved habitat, both in stream form and vegetative cover. Negligible short-term impacts would be expected related to construction disturbances, but there would be long-term beneficial impacts related to improved habitat condition. Before heavy equipment begins earth movement, the area would be surveyed and if turtles were located, they would be moved upstream and released.

The California red-legged frog (CRLF) and its designated critical habitat within PNM would likely be affected by Alternative B. At this point, there is no good habitat within the areas of phase I, II or III. CRLF have not been located within any of the project sites for the last 5 years, although historically CRLF were found in Phase IV. There is a small population (1-2 individuals) of CRLF 0.4 km downstream of the project site. It has been hypothesized that the lack of good habitat – vegetative cover and standing pools of water –above this population is a barrier to CRLF dispersal upstream. Construction is slated for late summer and early fall for each phase. This timing would be in a less critical time of the CRLF annual cycle – the breeding would be complete. Dispersal of the young metamorphs (first year frogs) would likely start in late August. However, known breeding sites are more than 2.5 km downstream, it is unlikely that a metamorph dispersing from these sites would arrive at the project areas. Therefore the potential direct impact of construction to CRLF is essentially non-existent. The expected decreased sedimentation rates would be associated with a decreased risk of destruction of habitat that is vital for breeding. Therefore, it would be expected that Alternative B would have beneficial impacts for the short- and long-term on CRLF habitat down stream of the project site. In the short-term, the disturbances to the habitat in phases I, II and III would be no worse than the current condition; thus the short-term negative impacts would be negligible. However, in the long-term, Alternative B would establish better vegetative cover and stream structure, thus it would be a beneficial long-term impact to CRLF habitat.

While no CRLF would be expected in the project areas, PNM wants to assure protection for the California red-legged frog. Surveys would be conducted prior to any heavy equipment operation. All contractor and employees working on the project would be trained in CRLF identification. All work would be conducted when the stream in the project site was dry (late summer and early fall, July through mid September), making the presence of CRLF in the area highly unlikely. A USFWS approved CRLF monitor would be on site during all earth movement to assure no CRLF are within the area. If any CRLF are located in the project site, all work will be halted and consultation with USFWS resumed. USFWS consultation has be completed for this project and USFWS concurred the proposed project was not likely to adversely affect CRLF.

The Pinnacles riffle beetle has been collected from the project area. No recent surveys have been conducted and park biologists believe the local habitat has been greatly altered during flood events in 1982, 1995, and 1998. Even though the construction activity will occur when there is no water in the stream, there is still a chance of impacting this species due to potential terrestrial pupal chambers. Because this species only uses stream riffles, delineating stream riffles and limiting equipment traffic in these areas can minimize impact. One section that cannot be avoided is a riffle just below the bridge realignment (Phase I, Figure 10). There is no way to avoid crossing the stream in this area, an approximately 6 m wide section, with heavy equipment. However, this riffle represents less than 10% of the riffles in the project area and less than 1% of the riffle habitat available to riffle beetles in the Monument. Thus, even if this traffic destroyed all the pupal chambers at this crossing, this would be a short-term minor impact since it only affected a small area and a single cohort. There would be no long-term impact because insects have the ability to rapidly reproduce and any individuals lost during the phase I construction year would easily be replaced in subsequent years.

The combined affects of Alternative B for all sensitive species would be short-term minor impacts with long-term beneficial impacts. Alternative B would not lead to impairment of special status species. There is no cumulative effect associated with this alternative and species of special concern.

<u>Non-native Species</u>: Any project that has ground disturbance is likely to be a conduit for non-native plant species. Most of the exotic weeds thrive in disturbed areas. At this point, monument staff are controlling three non-native plant species (horehound, mustard and yellow starthistle) in this project site. Control efforts are expected to continue for the foreseeable future. Because this alternative requires moving soil, it is expected that non-native plants would take advantage of the disturbed ground and could increase in numbers. These population increases would be expected to last for 3-5 years. These populations are not expected to persist because of our control efforts. There would be a moderate short-term impact and no long-term impact. . There is no cumulative effect associated with this alternative and non-native species.

There is concern for introductions of new exotic plant species coming into PNM on heavy equipment (e.g. bulldozers) or in fill. For Phases I, II, and III, all equipment would be steam cleaned before coming into PNM. Before it is unloaded, the equipment would be inspected to assure that the cleaning was thorough. For all phases, no dirt fill (the primary means of exotic seed transport) would be brought into PNM. For phase III, large boulders would be brought in for the rock barbs (bend-way weirs). While having seeds transported on rock is less likely than in soil, these boulders would also be washed to assure that no seed was inadvertently brought into PNM. Some portions of Phase IV would require the use of dirt fill. This dirt would be harvested on site in two ways. First, the existing trail would be dropped down a few inches and this material would be used to fill in the new sections of trail, making the trail grade even. Second, small bars of material would be taken from the stream. These bars were deposited in the last flood event and can be removed with no measurable effect on the stream. Phase IV would not require importing foreign fill and would not be likely to introduce new non-native species.

Air Quality, Traffic, Noise: Phase I, Phase II, Phase III of the alternative would have a minor short-term impact on traffic, noise, and air quality. Several truckloads of large rock would have to be imported into PNM, and approximately 250 truck loads of clean fill would have to be removed. It is anticipated that Phase I, II, and III would have approximately 100 truck-trips in and outside PNM. This would average 4 trips a day during of the phases. This activity would be limited to weekdays in the late Summer and early Fall and each phase would occur during a different year. This would be a negligible increase of traffic on Hwy 25 and on roads within PNM. Trucks would be covered with tarps to reduce dust during transport. The earth moving equipment would result in increased air pollution emissions over seasonal averages. Typically, air quality is worst in Summer due to high concentrations of ozone. A brief analysis of emissions was conducted. An analysis of air pollution was conducted to address the primary pollutant concerns at PNM including ozone and 10 micron particulate matter (PM10). The increased combustion emissions associated with earth moving equipment would release nitrogen oxides (NOx), which is a precursor to ozone, and PM10. During certain weather conditions, such pollution may not be dispersed away from PNM and may be detectable at the air quality station approximately 2.5 miles away. However, the brief analysis shows that the emissions would produce a minor increase in the air pollution generated within PNM. Because it is estimated that over 90% of the pollution recorded at PNM is generated in urban areas outside PNM, this impact would be considered negligible and would not likely exceed any ozone standard. PM10 emissions due to dust and disturbed earth would be mitigated by standard dust abatement procedures such as wetting roads and work areas. The PM10 dust emissions would be negligible.

For Phases I, II, and III, the construction activity is expected to be audible for visitors and wildlife for an approximate 0.75 km radius. Increased roadway noise would also be experienced. Visitation is lowest in December and January. However, the project cannot be implemented during this time frame due to the potential of stream flows and impacts to the California red-legged frog. The timing of the projects will attempt to avoid as much visitation as possible, targeting for late Fall. The disturbance would be a short duration (2-4 weeks for each phase), and the impacts would be distributed over different years, the overall impact would be minor.

Phase IV of the alternative would have no impact on air quality or traffic. There would be a negligible impact related to the noise of the occasional use of a pionjar (gas powered jackhammer). Typically a pionjar is used for 1-2 hours a day and is only expected to be used for a total of 5-7 days during this phase of the alternative.

Construction activity the for proposed projects would cause a minor but short-term impact to traffic and noise, but it would be limited to times when the human and natural environment is less sensitive. There would be no long-term impacts and this alternative is not likely to impair these air and experiential resources. There is no cumulative effect associated with this alternative.

Visitation and Visitor Experience: Alternative B would have impacts on visitor experience in two ways: access and quality of experience. Phase I would require closing the Old Pinnacles Trail from the East Side of the Monument. This closure would prevent visitors from easily accessing the North Wilderness Trail or the Balconies Caves. To minimize this impact, construction activity would be targeted for late Fall, times when visitation to PNM would be low. Visitation is lowest in December and January. However, the project cannot be implemented during this time frame due to the potential of stream flows and impacts to the California red-legged frog. Access to the Balconies Caves and North Wilderness Trail would either require the visitor to come the West Side of the Monument for easy access or it would require an additional 4 miles of hiking (going up and over the central High Peaks), a moderate to difficult hiking trail. Phase II, III, and IV would not require any trail closures and would therefore not impact trail access. Due to the timing and duration of the project and the ability of visitors to access the North Wilderness Trail and Balconies Caves from the West Side, this would be considered a minor impact

All phases of Alternative B would have a minor impact on visitor experience. Construction would take place in late fall when visitation is low. The short (2-4 weeks) period when heavy equipment is working would have an impact to the visitor's sense of solitude and naturalness, but the short duration, limitation to weekday activity, and isolated area would only result in a negligible impact. In phases I and IV, installation of temporary (2-5 years) dark-green fencing would be required. This fencing is currently used in several locations throughout PNM to prevent short cutting on trails and to allow vegetation time to recover from trampling. PNM receives numerous complaints about the fencing, primarily that it is ugly and unsightly. Management continues to use this style of fence because it is highly effective in stopping people traffic and it is relatively inexpensive and easy to construct. Upon removal, the area requires little to no restoration from the fencing. Because this style of fencing is disliked in other areas of PNM, it would be expected to negatively affect the visual quality of a visitor's park experience in this area as well. The dark green color is chosen to provide the maximum amount of camouflage; the fencing is difficult to see from long distances. Additionally, tree felled on the project site will be used as barriers as well, to minimize the amount of barrier fencing needed. Thus the impact to the visitor's visual experience would be expected only in the vicinity of the fencing. The fencing is expected to be in place for 2-5 years and would be considered a minor impact to the visual experience. Therefore the overall impact to visitor access and experience would be a minor short-term impact with no long-term impacts and would not lead to impairment. There is no cumulative effect associated with this alternative.

<u>Cultural Resources:</u> The segment of road extending from the Monument's maintenance facility along Chalone Creek up towards Willow Spring is over 50 years old and is a part of the road and trail network system established by the CCC throughout PNM. The road, however, does not illustrate the quality of work demonstrated by the CCC in other areas of PNM such as the exemplary rock walls, culverts and tree wells built along the roads and streams in Bear Gulch or Condor Gulch. Although the road is an individual component of the overall CCC work within PNM, it is not considered a significant contributing resource related to the overall CCC achievements. The road circulation pattern established by the CCC is being retained except where modifications need to occur to remove the road from the flood plain.

Use of roadbed material to restore the natural topography in the two quarries is not considered a negative impact. The CCC acknowledged that one of their goals was to restore disturbed borrow areas within PNM. Possibly because of their size, however, these two quarries were never reclaimed.

Although the road is not considered a significant cultural resource related to the CCC period of development, several measures would be taken prior to trail realignment to document the CCC work. These include:

- Only road alignment modifications required to minimize problems associated with the road's location within, and impact to, the floodplain and creek would be implemented. This will help ensure the trail retains as much of its original alignment as is feasible.
- Lowering the dike at Chalone Picnic Area would occur along the historic alignment (Phase III).
- Any changes to the existing road alignments and the two quarry locations to be reclaimed would be GPSed and added to PNM's cultural resource data inventory.
- All sections of the road impacted by the proposed action would be photo-documented using black-and-white photographs for archival purposes. All road materials, including the gravel surface, drainage culverts and retaining walls that are to be relocated, would be modified according to the Secretary of Interior's Standards for the Treatment of Historic Properties.
- Interpretive signs would be included along the Old Pinnacles Trail providing information about the borrow pits and the NPS efforts to restore them to their natural appearance.

Alternative B would result in minor impacts to historic cultural resources in the short- and long-term. Alternative B would not result in impairment to the historic resource. There is no cumulative effect associated with this alternative.

<u>Wilderness</u>: This alternative would potentially affect wilderness in three ways: access, solitude, and designation. In Phase I, approximately 300 of the 500 meters of the project is within designated wilderness. The use of large machinery (bulldozers, excavators, etc.) were determined to be the minimum tool (Minimum Requirement Decision Document, on file at PNM). The work conducted in this area would have a short-term impact on wilderness by limiting access to the wilderness due to trail closures during construction. The closure and construction period would be less than 4 weeks, thus the impact would be considered minor. Phases II, III, and IV would not require any trail closures and would not impact wilderness access. Due to construction noise associated with Phases I, II and III a minor impact to wilderness solitude would be expected. Each of these phases lasts less than 4 weeks, thus the impact would be considered minor. Phase IV would be entirely within designated wilderness. This project would be conducted by day laborers using handtools and an occasional jackhammer, so the impacts to wilderness solitude and quiet are expected to be negligible. Phases I and II in this alternative would restore approximately 60 acres of land by removing a roadbed, which originally excluded this section of land from wilderness designation. By removing the roadbed and returning the area to its natural condition, this section may be eligible for wilderness designation. Alternative B would result in a short-term minor impact associated with access and solitude and would have a long-term beneficial impact in restoring a wilderness area. Alternative B would not result in any impairment to the wilderness resource. There is no cumulative effect associated with this alternative.

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Figure 1

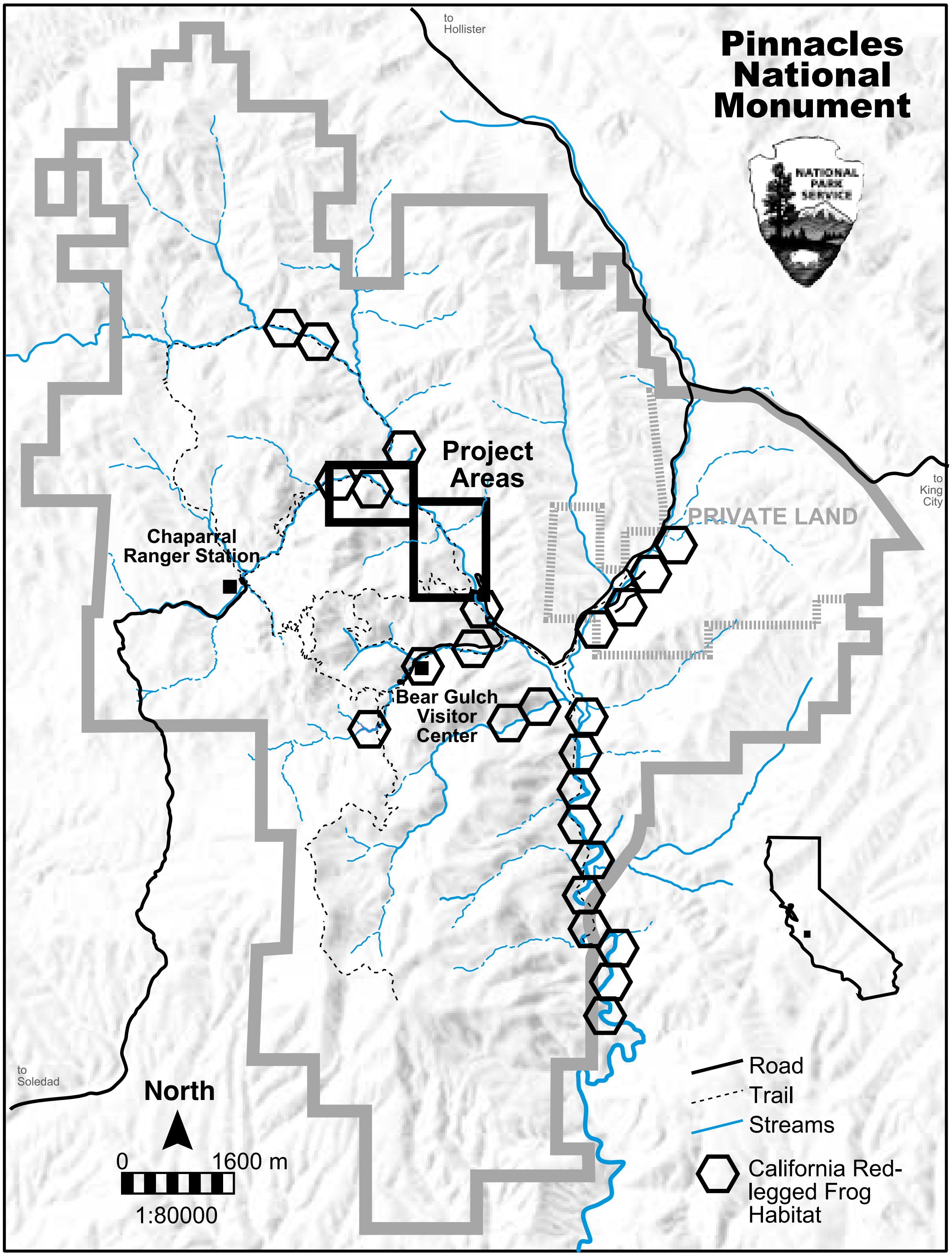

Pinnacles
National
Monument
NATIONAL
PARK
SERVICE
to
Hollister
to
King
City
to
Soledad
Project
Areas
PRIVATE LAND
Chaparral
Ranger Station
Bear Gulch
Visitor
Center
North
0
1600 m
1:80000
Road
Trail
Streams
California Red-legged Frog Habitat

Figure 2.1 **Riparian Area Features**

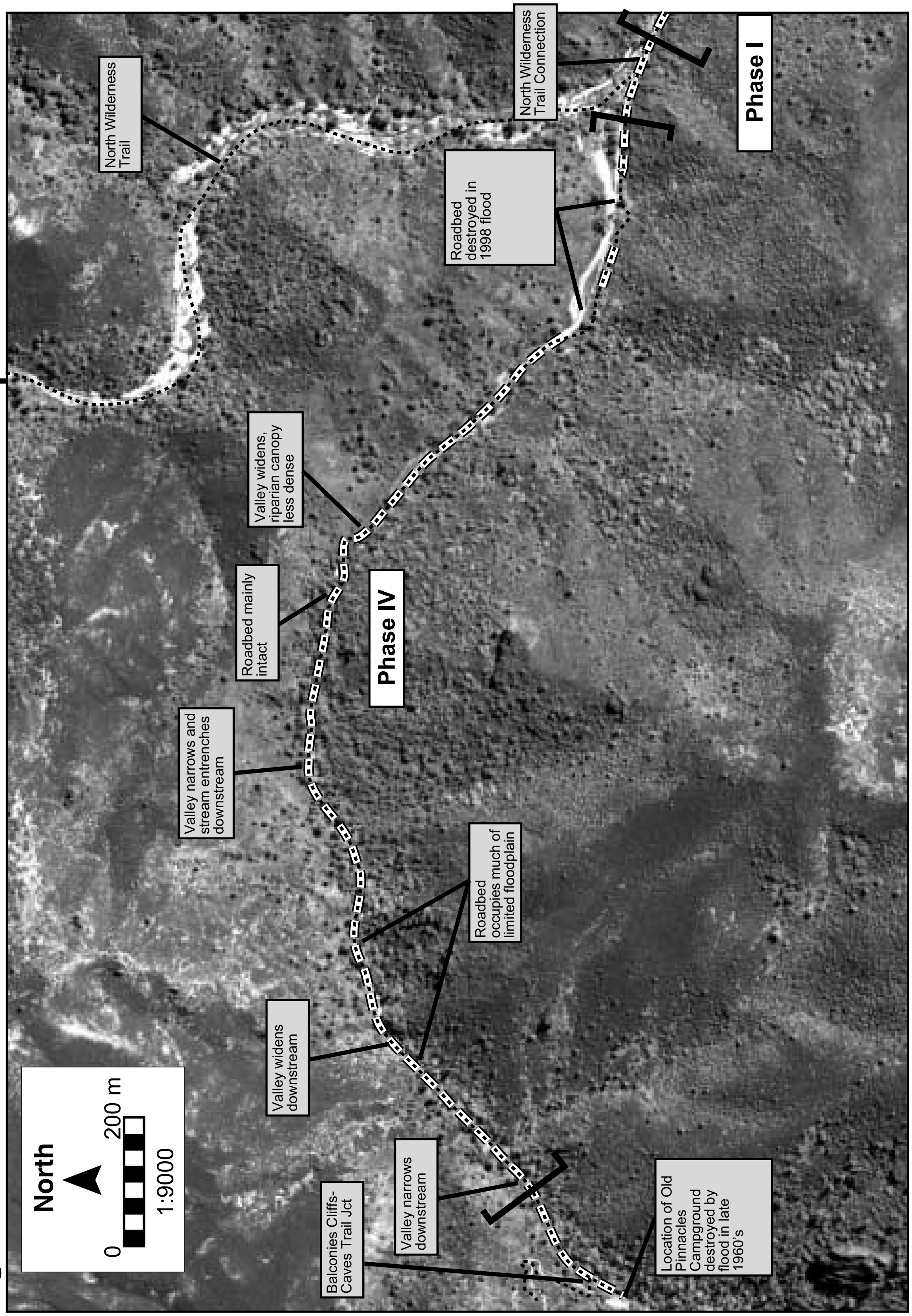


Figure 2.2

Riparian Area Features

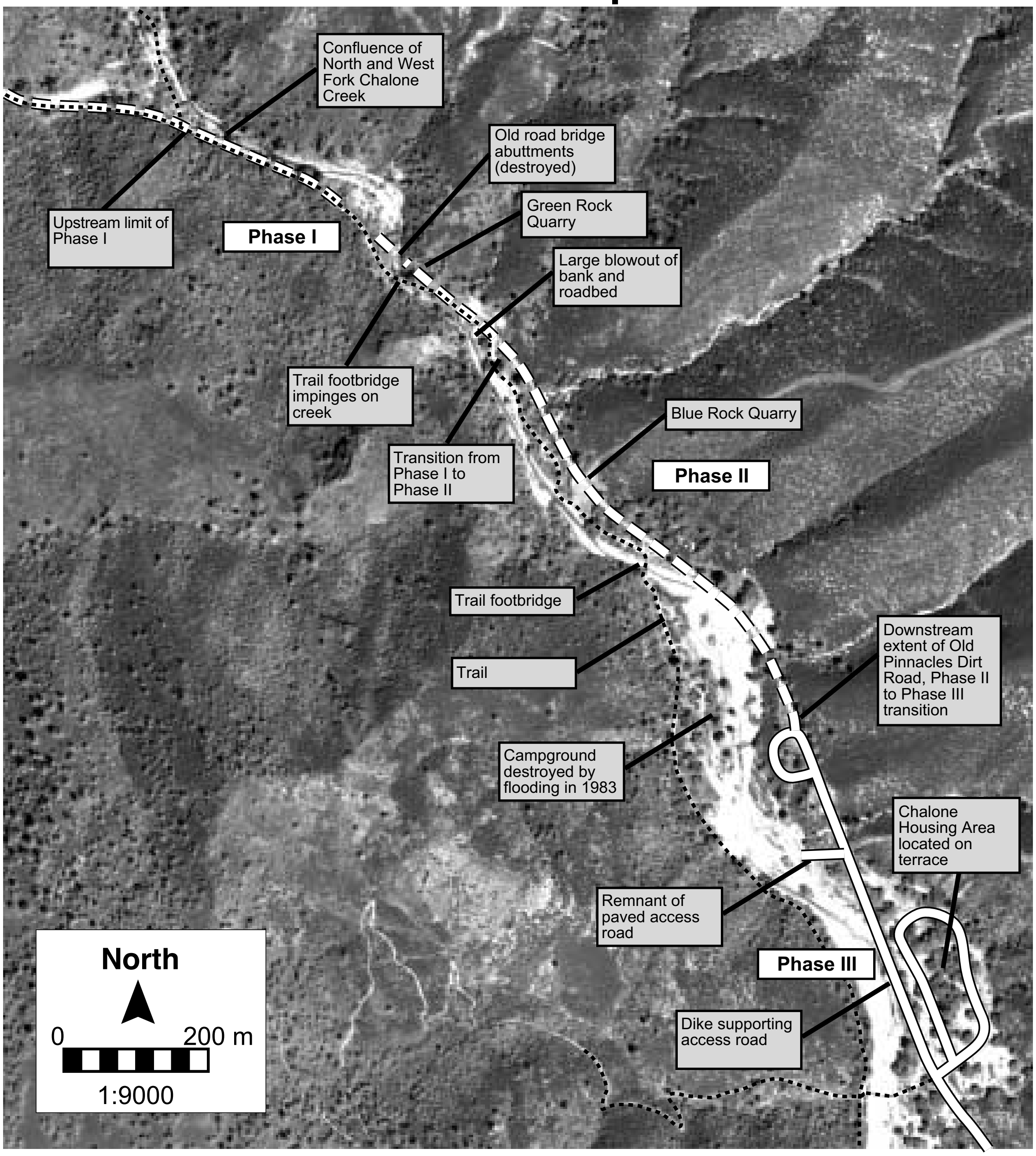


Figure 3.1

Channel Changes 1994-2000
Phases IV section

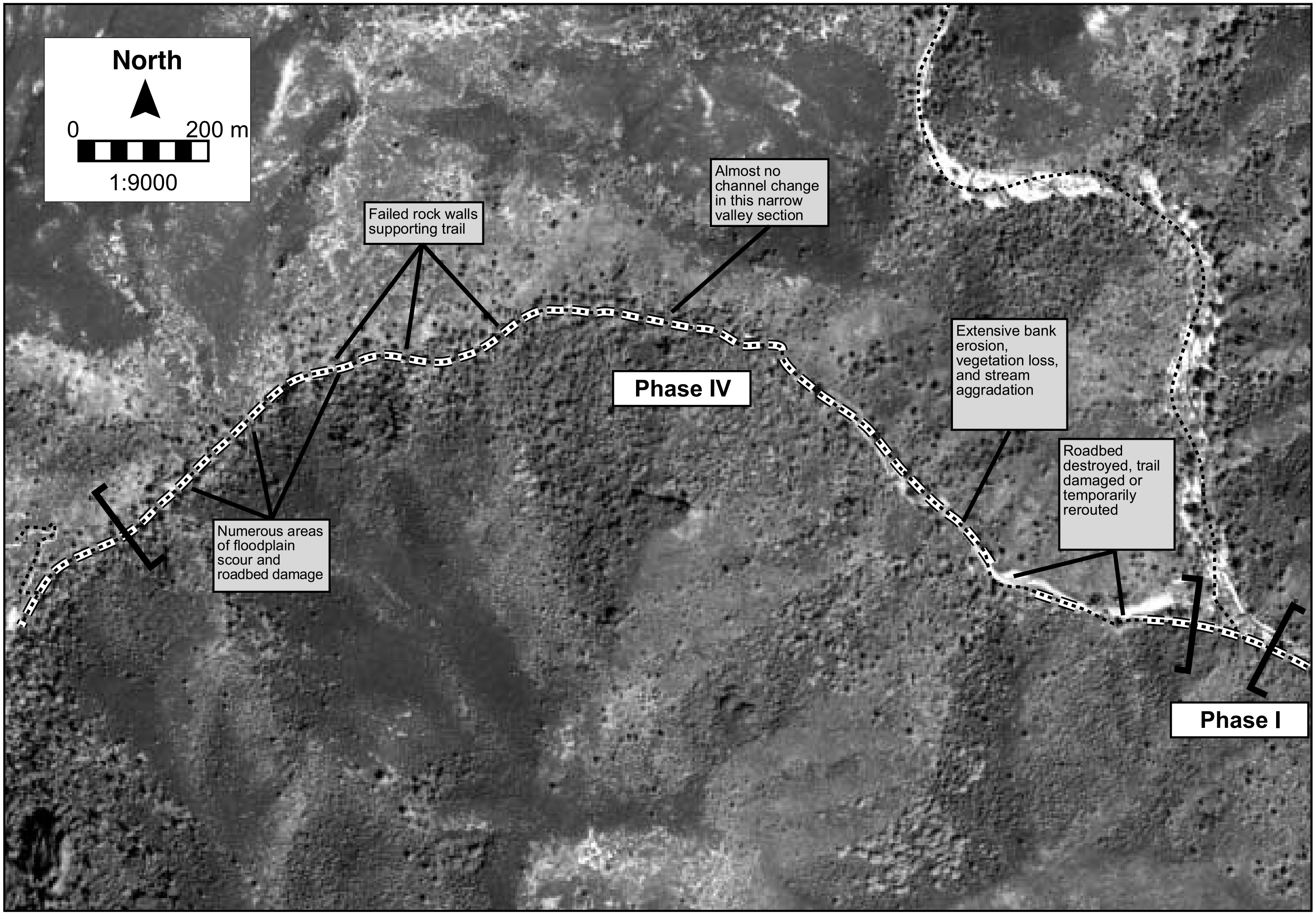


Figure 3.2

Channel Changes 1994-2000
Phases I, II, III sections

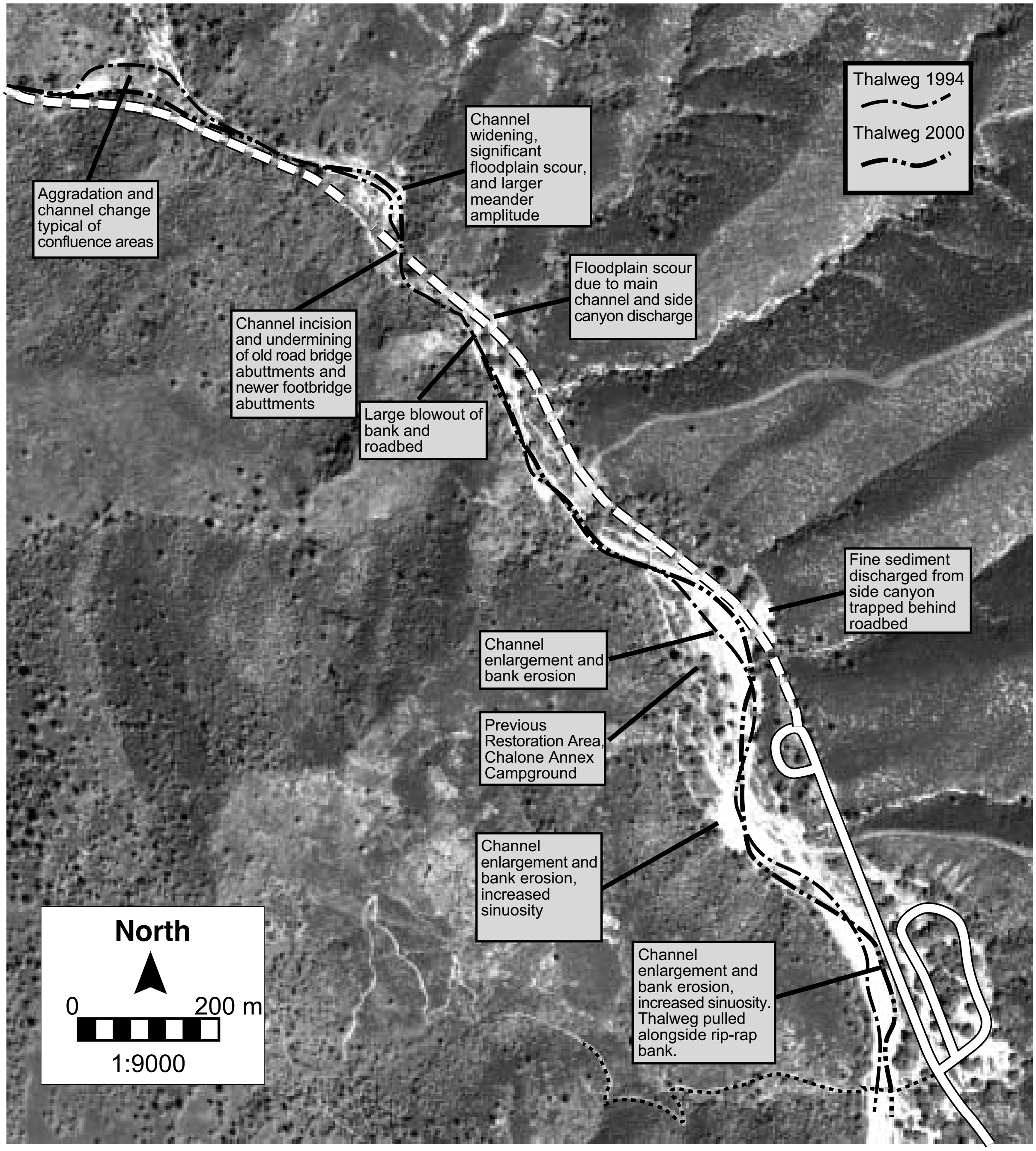


Figure 4

Concept Sketch
Channel and Floodplain Cross-section

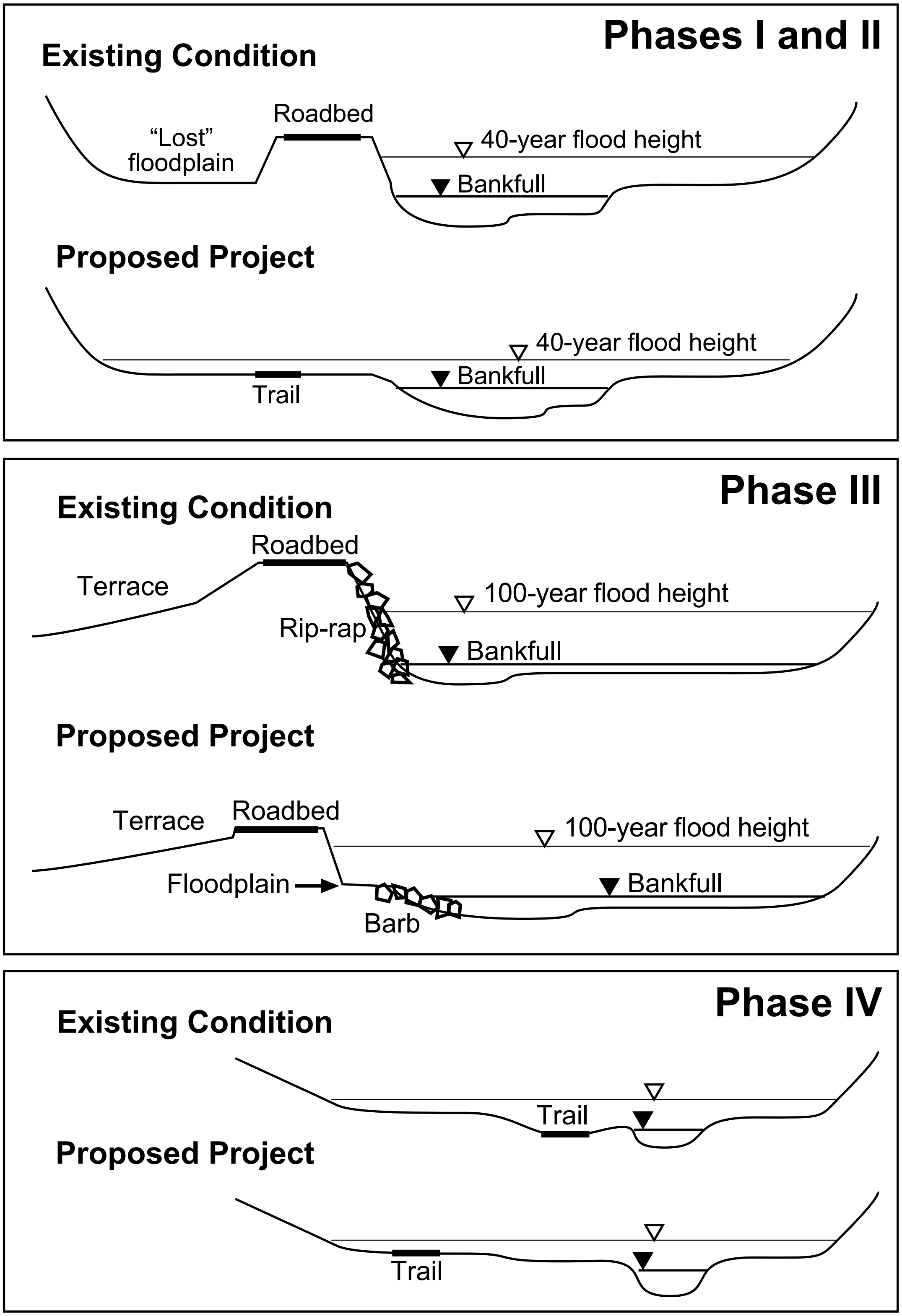


Figure 5.1

Project Phases

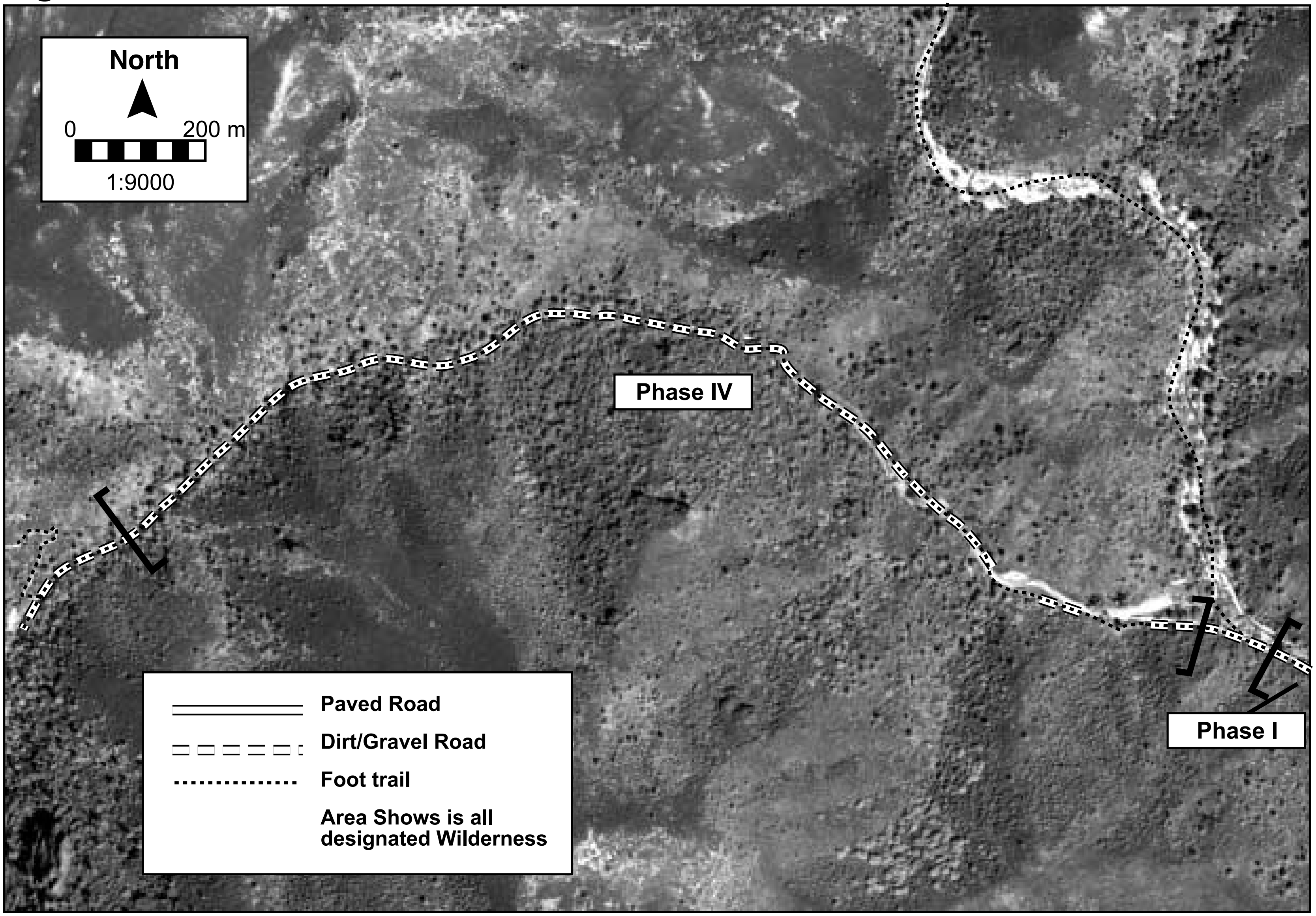


Figure 5.2 **Project Phases**

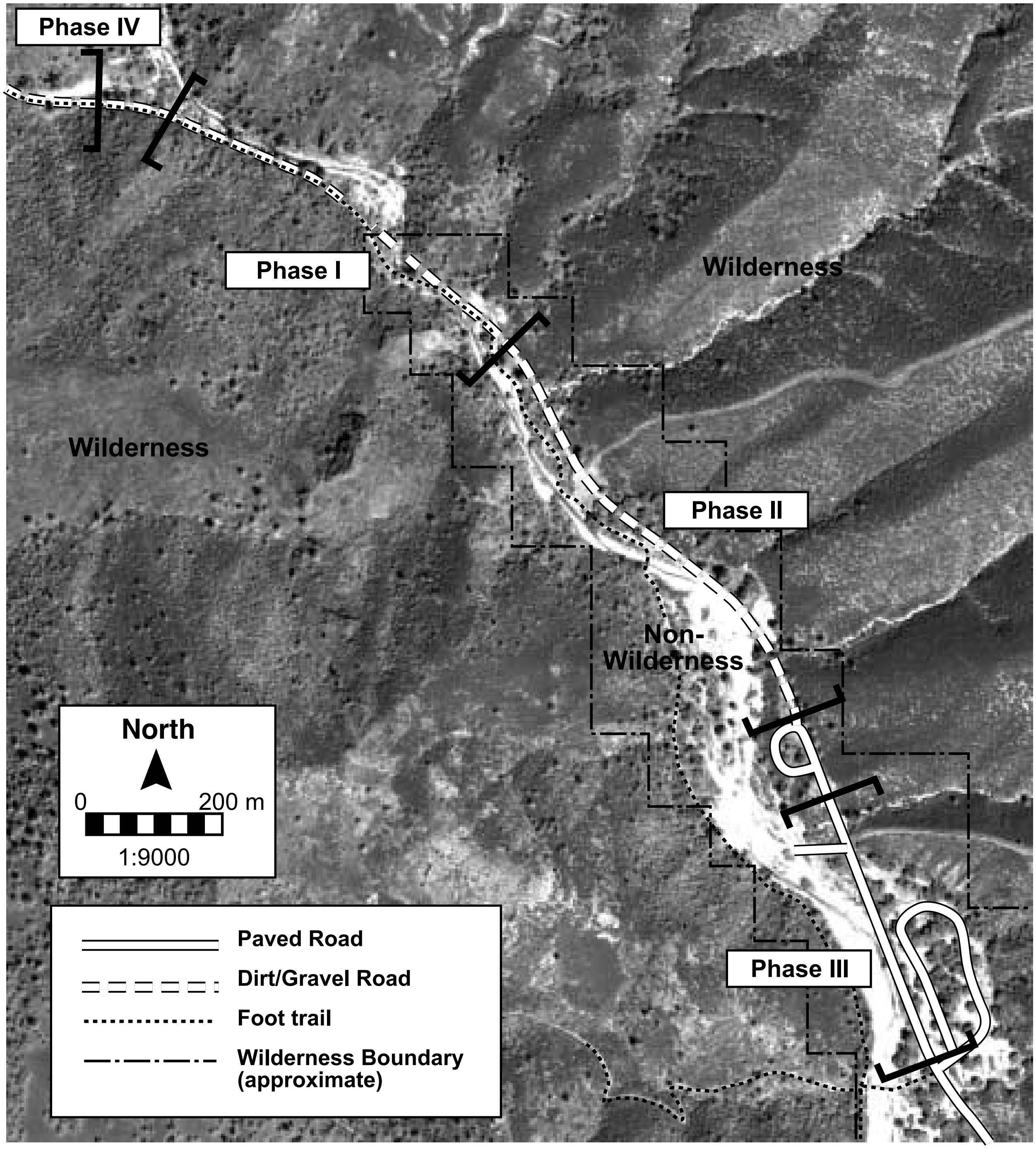


Figure 6

Cut Cross-Sections and Fill Volume Estimates

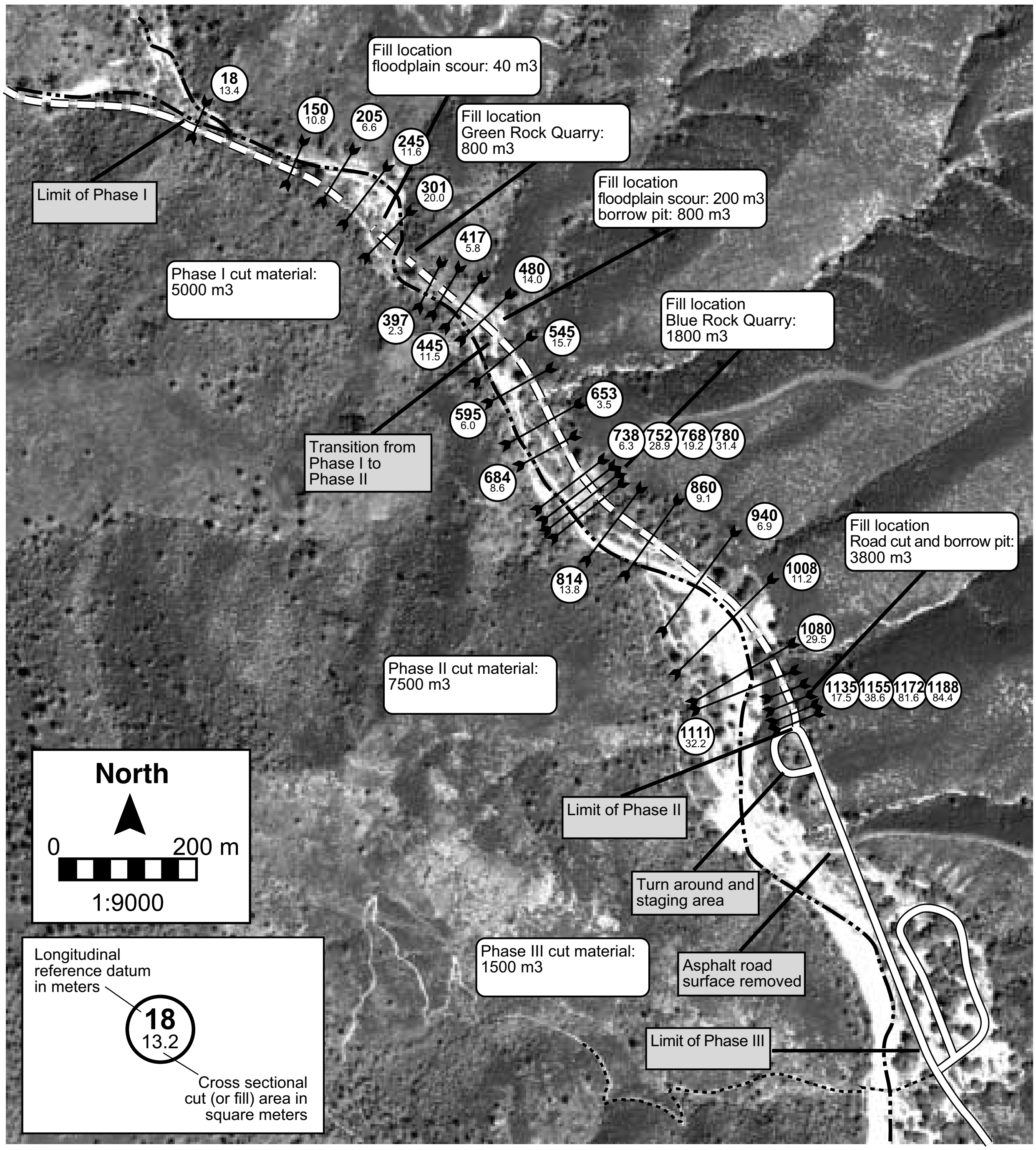
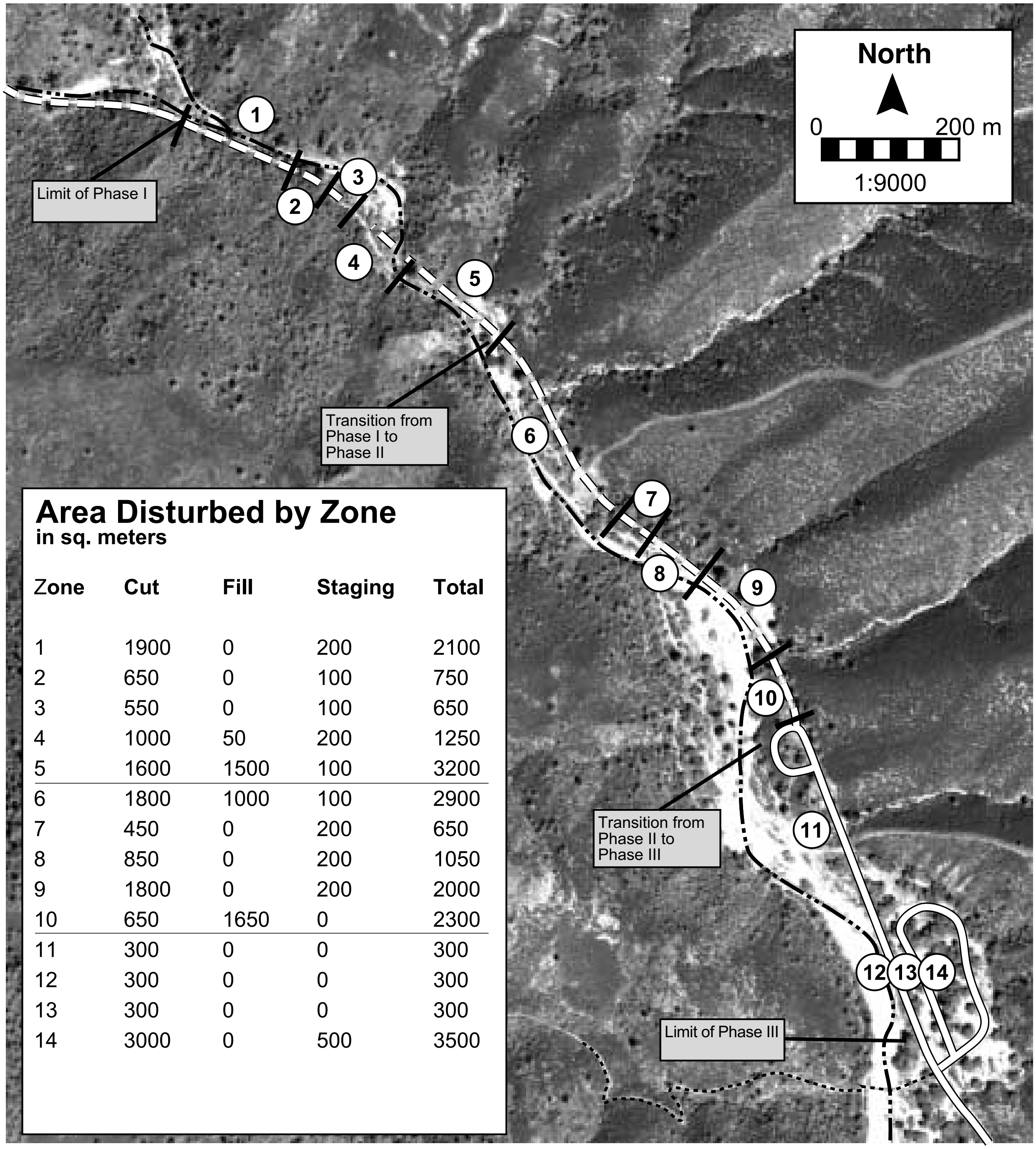


Figure 7

Revegetation Zones



Area Disturbed by Zone
in sq. meters

Zone	Cut	Fill	Staging	Total
1	1900	0	200	2100
2	650	0	100	750
3	550	0	100	650
4	1000	50	200	1250
5	1600	1500	100	3200
6	1800	1000	100	2900
7	450	0	200	650
8	850	0	200	1050
9	1800	0	200	2000
10	650	1650	0	2300
11	300	0	0	300
12	300	0	0	300
13	300	0	0	300
14	3000	0	500	3500

Figure 8

Staging, Fueling, Turn Around, and Topsoil Storage Areas

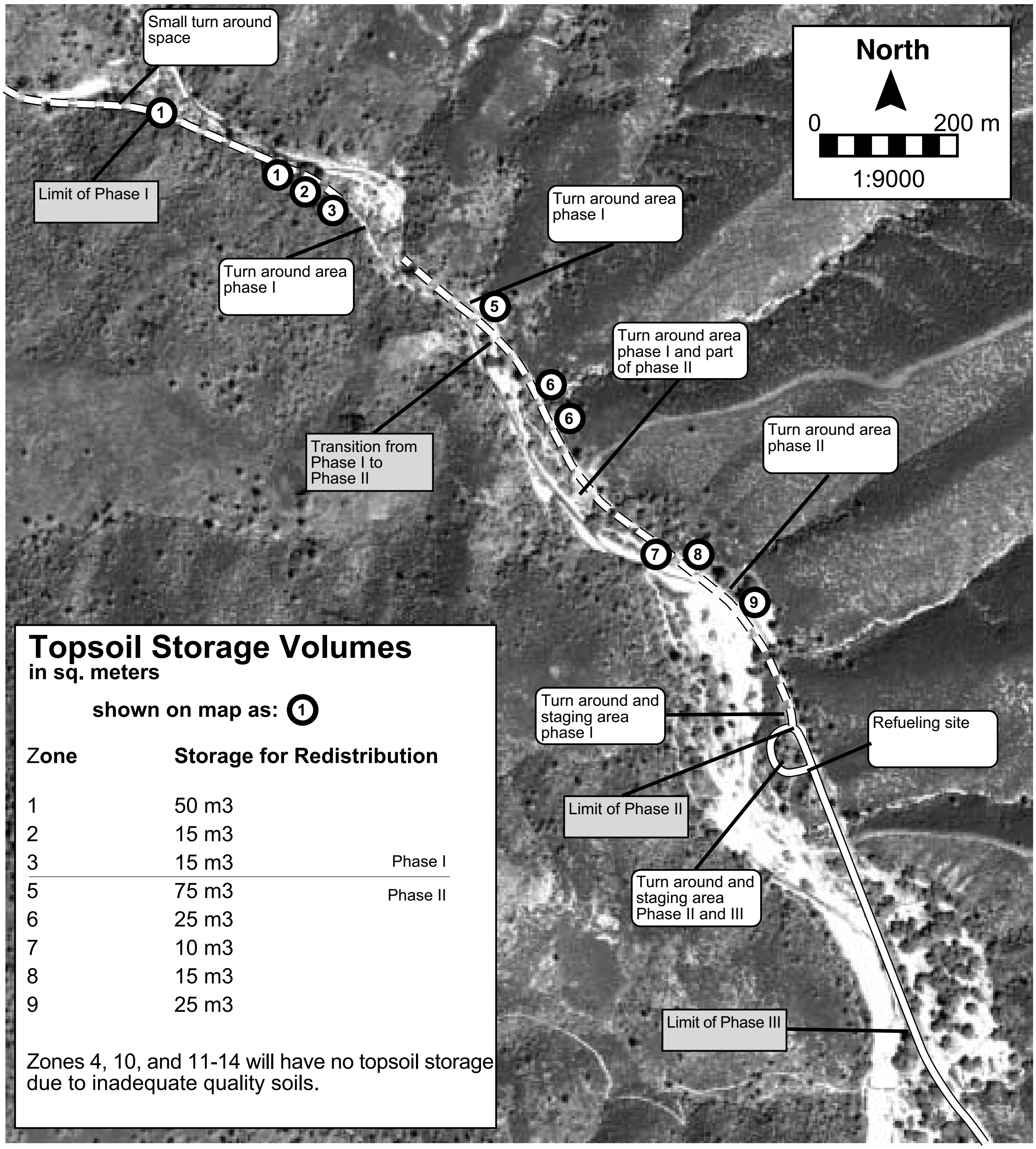
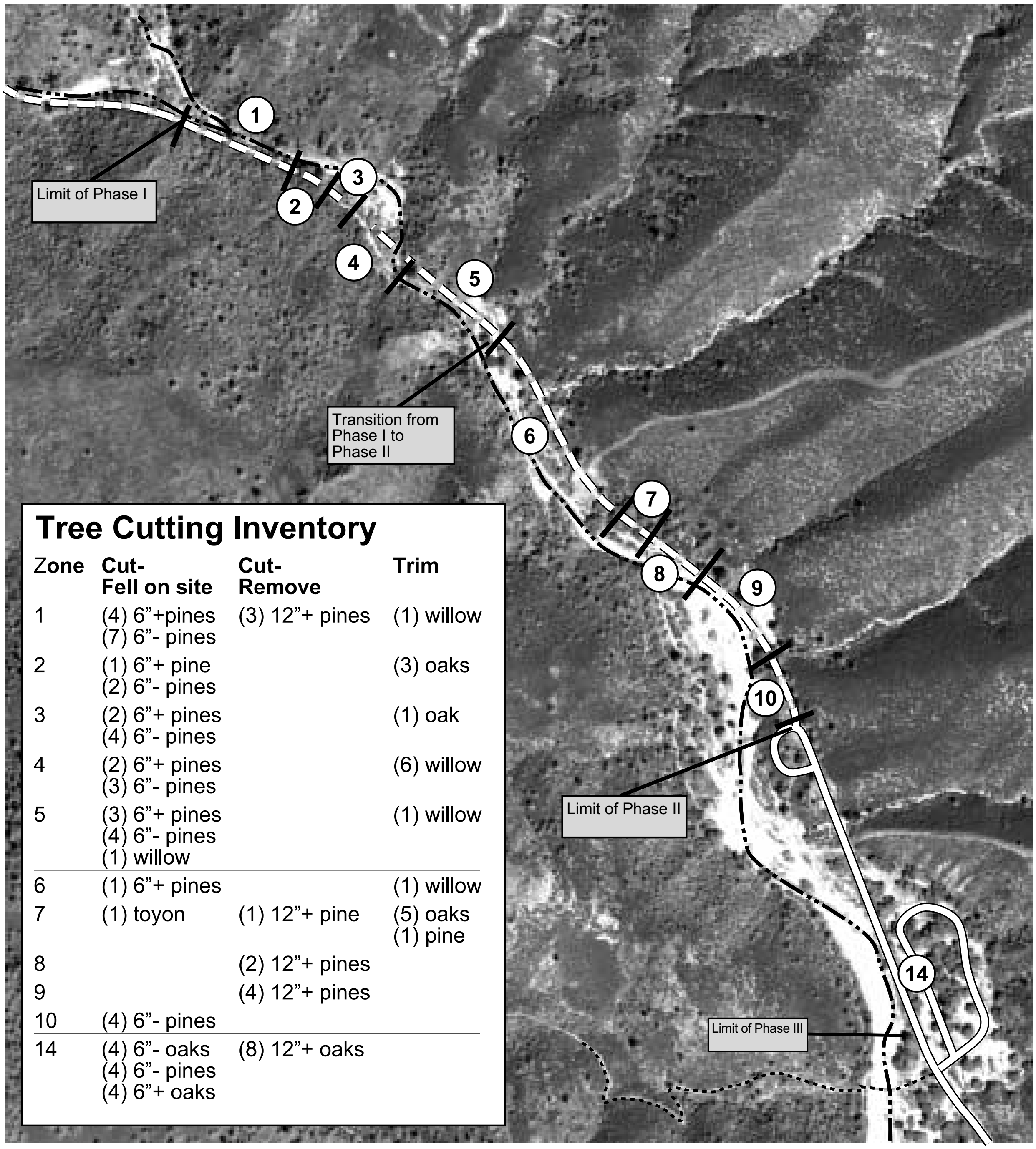


Figure 9

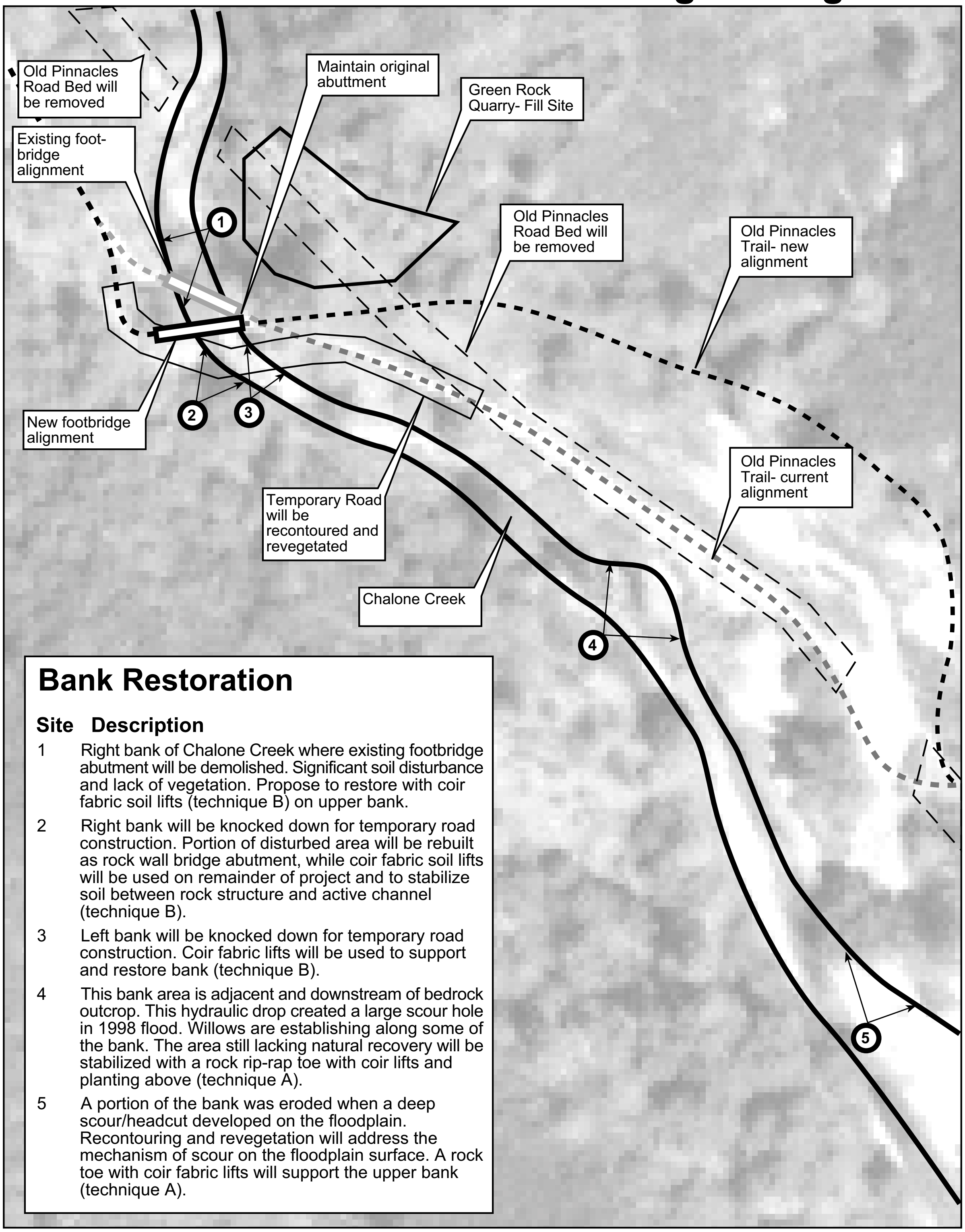
Tree Removal



Tree Cutting Inventory

Zone	Cut- Fell on site	Cut- Remove	Trim
1	(4) 6"+pines (7) 6"- pines	(3) 12"+ pines	(1) willow
2	(1) 6"+ pine (2) 6"- pines		(3) oaks
3	(2) 6"+ pines (4) 6"- pines		(1) oak
4	(2) 6"+ pines (3) 6"- pines		(6) willow
5	(3) 6"+ pines (4) 6"- pines (1) willow		(1) willow
6	(1) 6"+ pines		(1) willow
7	(1) toyon	(1) 12"+ pine	(5) oaks (1) pine
8		(2) 12"+ pines	
9		(4) 12"+ pines	
10	(4) 6"- pines		
14	(4) 6"- oaks (4) 6"- pines (4) 6"+ oaks	(8) 12"+ oaks	

Figure 10 Footbridge Realignment



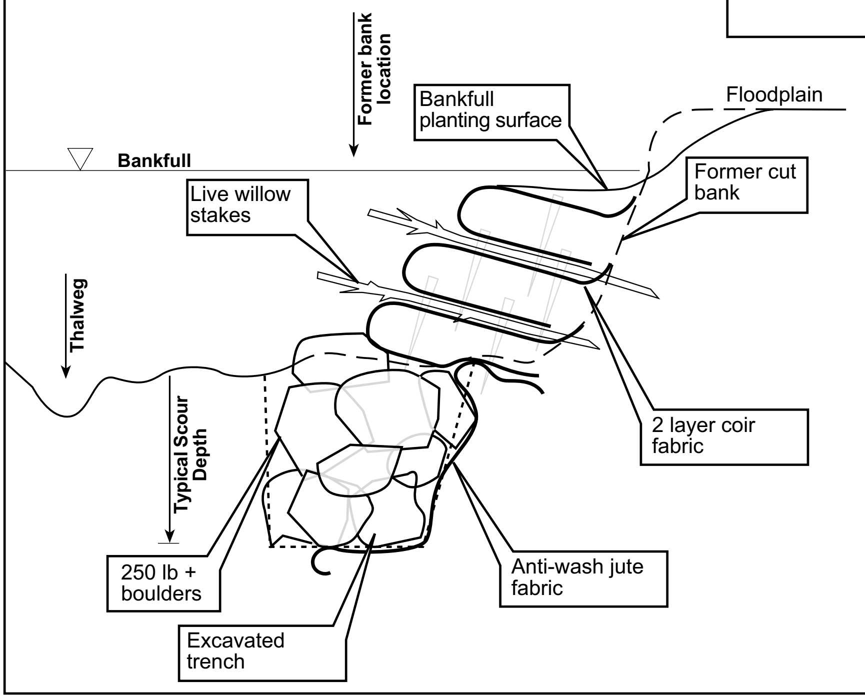
Bank Restoration

Site	Description
1	Right bank of Chalone Creek where existing footbridge abutment will be demolished. Significant soil disturbance and lack of vegetation. Propose to restore with coir fabric soil lifts (technique B) on upper bank.
2	Right bank will be knocked down for temporary road construction. Portion of disturbed area will be rebuilt as rock wall bridge abutment, while coir fabric soil lifts will be used on remainder of project and to stabilize soil between rock structure and active channel (technique B).
3	Left bank will be knocked down for temporary road construction. Coir fabric lifts will be used to support and restore bank (technique B).
4	This bank area is adjacent and downstream of bedrock outcrop. This hydraulic drop created a large scour hole in 1998 flood. Willows are establishing along some of the bank. The area still lacking natural recovery will be stabilized with a rock rip-rap toe with coir lifts and planting above (technique A).
5	A portion of the bank was eroded when a deep scour/headcut developed on the floodplain. Recontouring and revegetation will address the mechanism of scour on the floodplain surface. A rock toe with coir fabric lifts will support the upper bank (technique A).

Figure 11 Bioengineering Techniques A and B

Cross-section

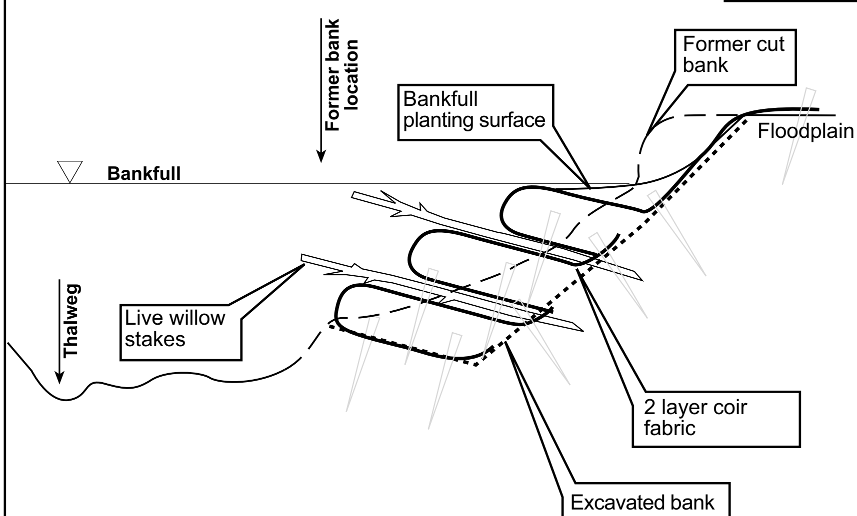
Soil Lifts with Rock Toe Support
Technique A



Where banks have been completely eroded away, significant bioengineering is necessary. Trenching, monitoring, and geomorphic evidence suggest that bed scour is a significant process in bank failure on Chalone Creek. Therefore, rock toe protection buried in the stream channel is needed to stall this process. The coir fabric soil lifts, composed of a high tensile strength outer fabric with a tightly woven inner fabric, support bank soil until vegetation can be established. The willow stakes and planting increase bank roughness and reduce flow velocities.

Cross-section

Soil Lifts on Upper Bank
Technique B



Damaged banks still possessing cohesive sections may be treated with less engineering. Toe scour is only addressed through increasing channel boundary roughness. Two layer coir fabric soil lifts degrade over 4 years and provide substantial strength until vegetation can be established. The coir lifts and bank are angled back more in this technique.

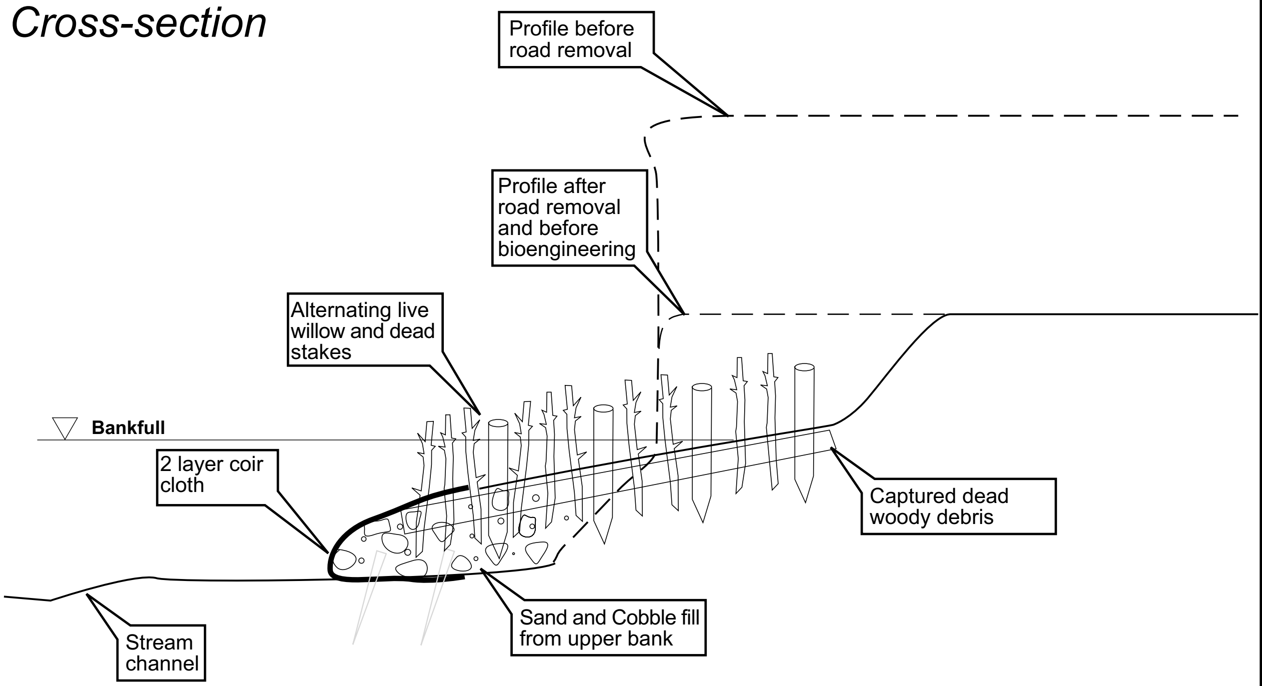
Figure 12 Bioengineering Technique C

Benching of Cut Banks and Traverses

Technique C

Dry, gravelly cut banks present a challenge to restore. One technique likely for these situations is to "bench" or notch the shear bank. This provides an area where vegetation can reach roots down to subsurface water. The coarse nature of the bank is inappropriate for anchoring large woody debris, therefore, medium-sized logs will be oriented perpendicular to the flow and captured by live willow and dead stakes. Coir fabric will slow toe erosion and surface erosion. In areas with significant bed scour, this design will gradually erode away. It is anticipated that a portion of the bank will revegetate and stabilize before this point.

Cross-section



Profile

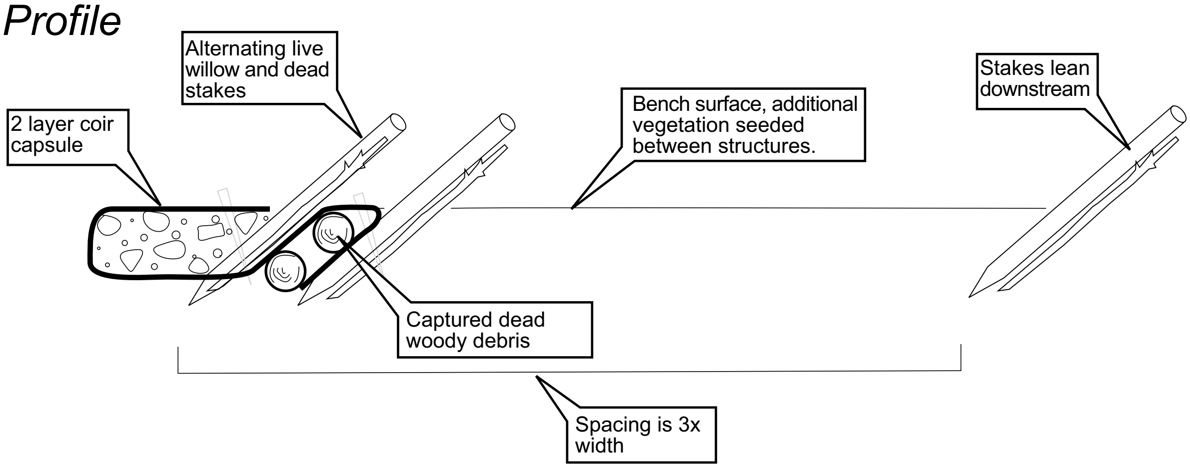


Figure 13.1

Bioengineering Technique D

Barb (bend-way weir) Cross-section
Technique D

Cross-section

How Barbs are Designed

Barbs, also called bend-way weirs or vortex weirs, are composed of heavy rock. They project into the stream channel and point upstream. They are often keyed into a bank, however failure typically occurs gradually at the tip. They protrude into the channel only enough to displace the fastest water velocities away from the bank. Spacing, height, and angle of barbs is critical to achieve the desired result.

How Barbs Work

At bankfull or high flows, water drops over the barb perpendicularly to the face. This directs the water away from the bank. Upstream of the barb along the bank, water is slowed. This creates a depositional area in the space between barbs. Over time, the barbs are often enveloped by a newly formed floodplain, and the deepest channel (thalweg) is moved further from the bank, thereby isolating the high velocity flows from erodable banks.

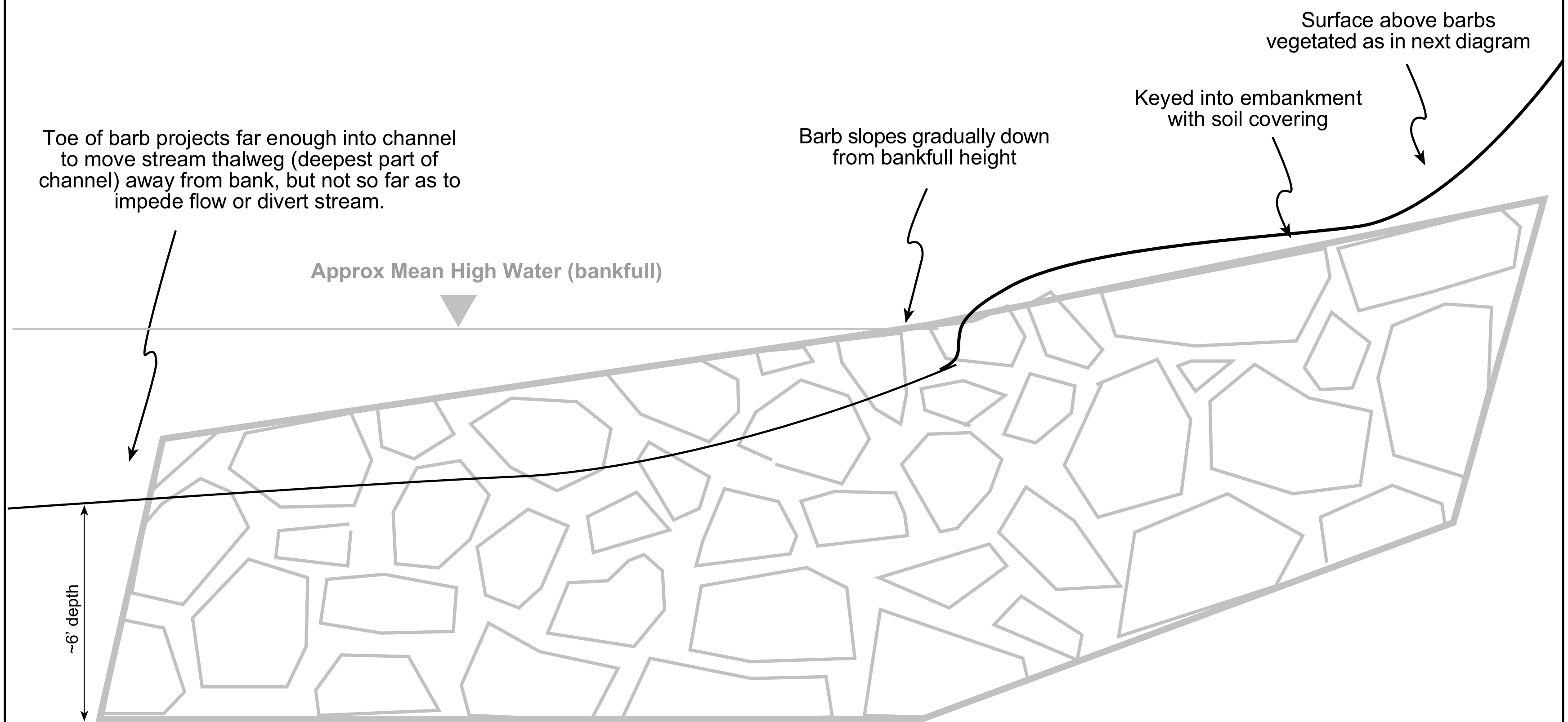


Figure 13.2

Bioengineering Technique D

Pole Planting between Barbs
Technique D

Cross-section

Live Pole/Stake Cuttings
These must be driven deep, approximately 3 feet for the willow stakes and 4 feet for the cottonwood poles. Cuttings can be harvested within the park. Willow stakes should be 1-1.75 inches in diameter, and Cottonwood poles should be 2-3.5 inches in diameter. These should be properly treated before installation.

Coir Fabric Lift
High tensile strength coir fabric provides support for constructed floodplain bench and will degrade in 4-6 years. This should allow time for vegetation to establish. Coir lift is two-ply design, with high strength material on the outside and finely woven biodegradable filter fabric underneath. The entire lift is secured with 1-1.5 wooden wedges per linear foot, 18-24 inches in length. The lift also provides some resistance to lateral bank erosion.

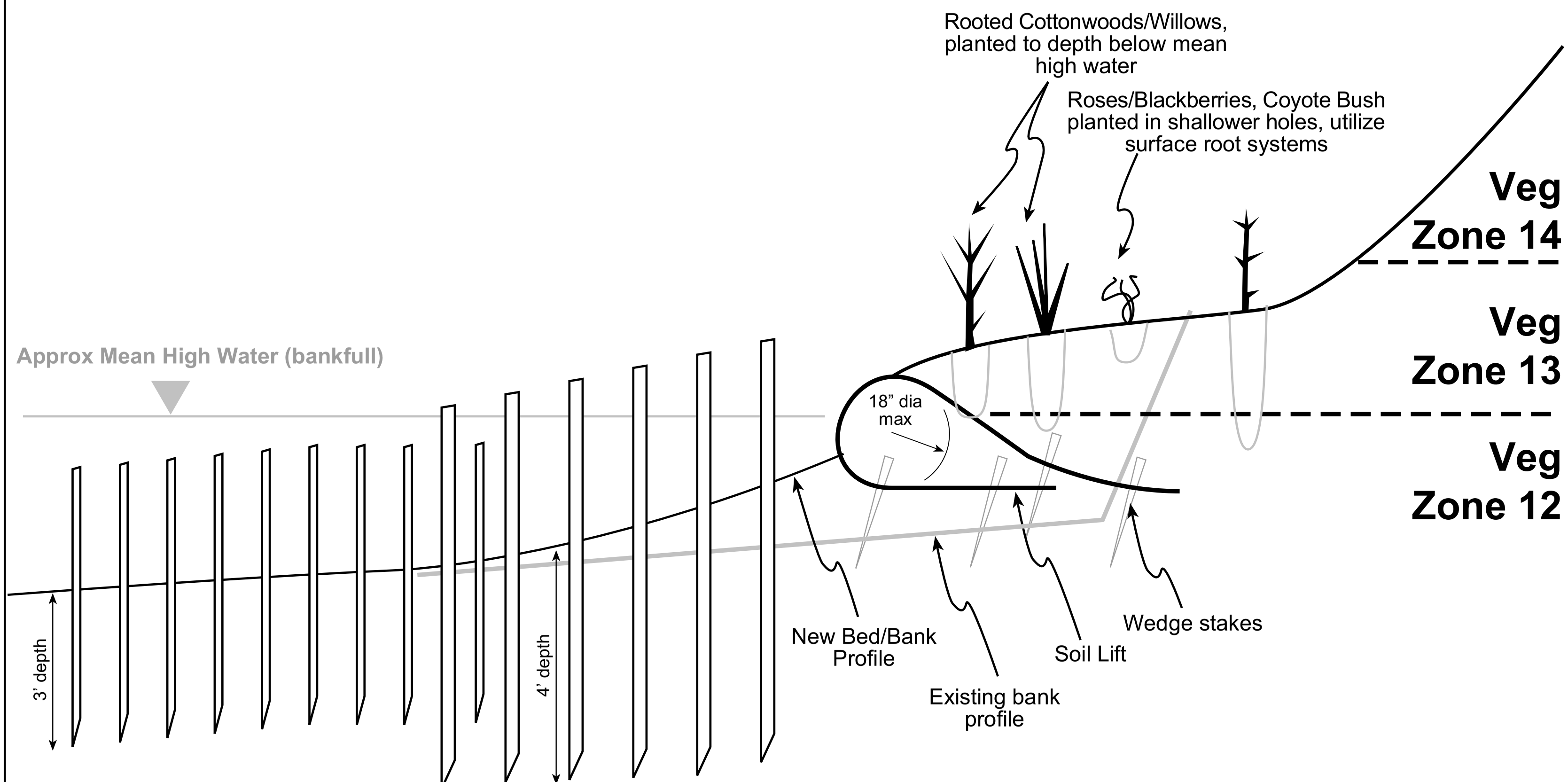


Figure 13.3

Bioengineering Technique D

Vegetation Schematic
Technique D

0’ 20’ 40’

Plan view

Zone 14
xeric vegetation community. Begins at approximately 50-yr flood height up in elevation to paved road bed. No irrigation necessary

Design Need— Stabilize soil and prevent dry ravel, sloughing, and washing during very high flood events. Also reduces dike soil pore pressure by root water uptake. Provides an aesthetic blend with surrounding natural areas.

Zone 13
mesic riparian vegetation community. Begins at approximately mean high water mark up in elevation to Zone 14, covering disturbed former bank area. Surface irrigation may be necessary if planted out of season or below normal rainfall occurs after planting. Contact with surface water table is required during Spring.

Design Need— Provide root tensile strength to disturbed sandy soil and hydraulic roughness during high water events. Also reduces dike soil pore pressure by root water uptake. Provides an aesthetic blend with surrounding natural areas and riparian habitat.

Zone 12
phreatophytic riparian vegetation community. Begins in active channel and extends to high water mark. Deep planting of live poles or deep irrigation will be necessary.

Design Need— Dramatically increases hydraulic roughness to promote deposition between rock structures. Provides riparian and aquatic habitat.

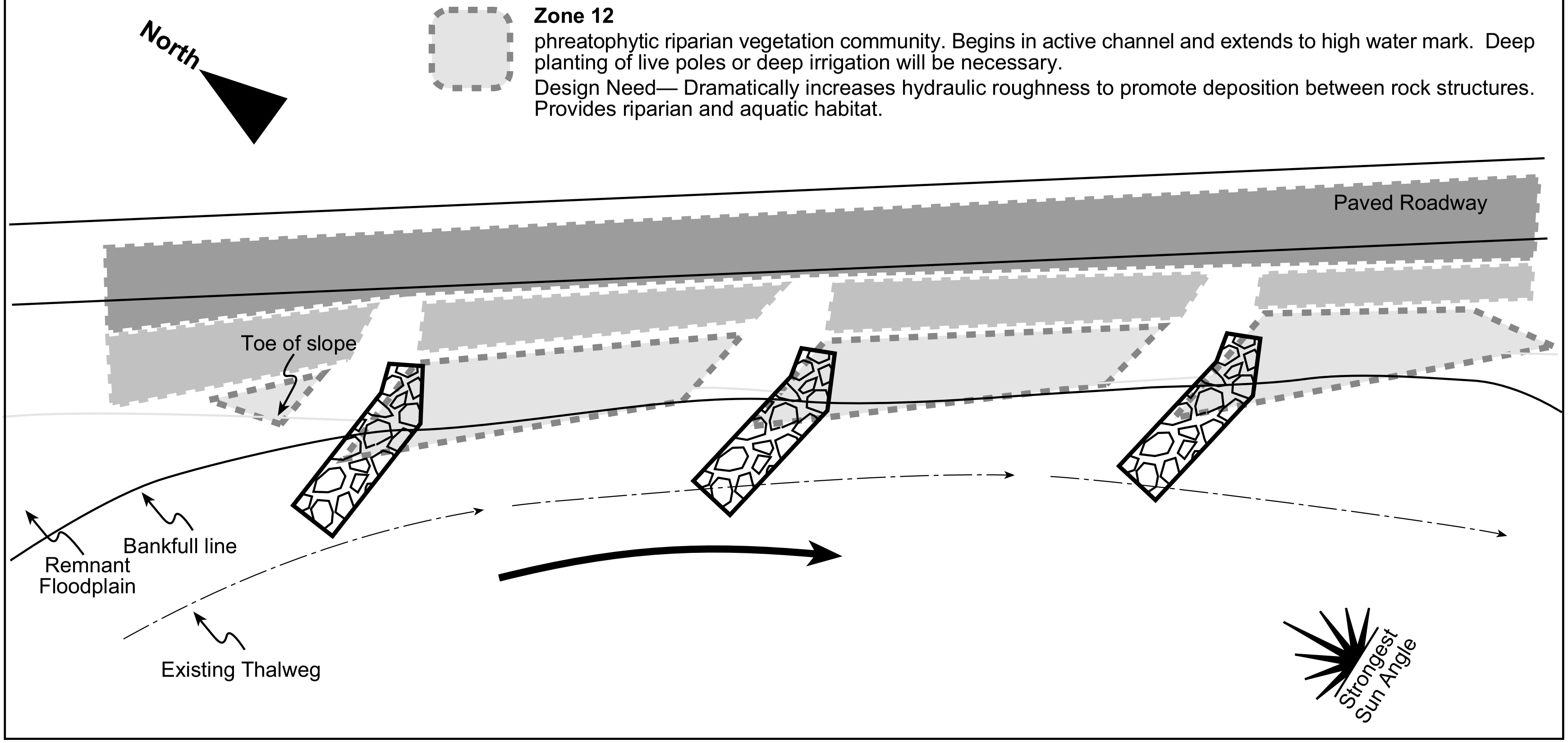
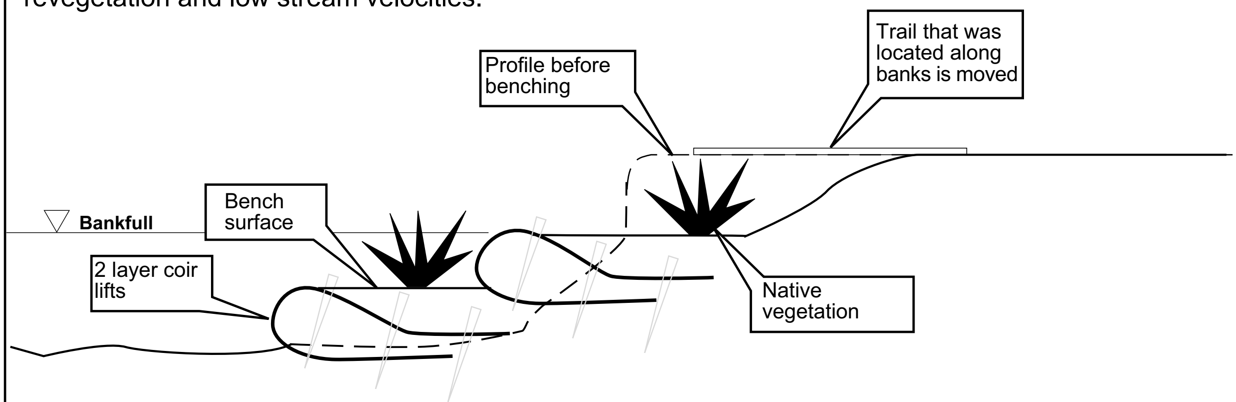


Figure 14 Bioengineering Techniques E and F

Cross-section

Benching of Cut Banks with Lifts
Technique E

Some areas have bank erosion due to trampling of vegetation and trail placement. These damaged banks with low relief will be benched. This creates a flat plantable surface for buckwheat and other small shrub species. This technique must be used in areas with minimal toe scour. Two-layer coir fabric soil lifts degrade over 4 years and provide substantial strength until vegetation can be established. This is a preferable technique in cohesive fine soils and with good prospects for revegetation and low stream velocities.



Cross-section

Floodplain Rebuilding and Roughening
Technique F

Some areas have floodplain erosion due to trampling of vegetation and trail placement. These damaged floodplains have been scoured in recent floods. To restore them, their original contour will be recreated and the trail/trampling pressure removed. A low rock wall will be used to edge the recent fill, coir fences will be installed to minimize surface erosion during the first 2-4 years, and the former trail area will be revegetated.

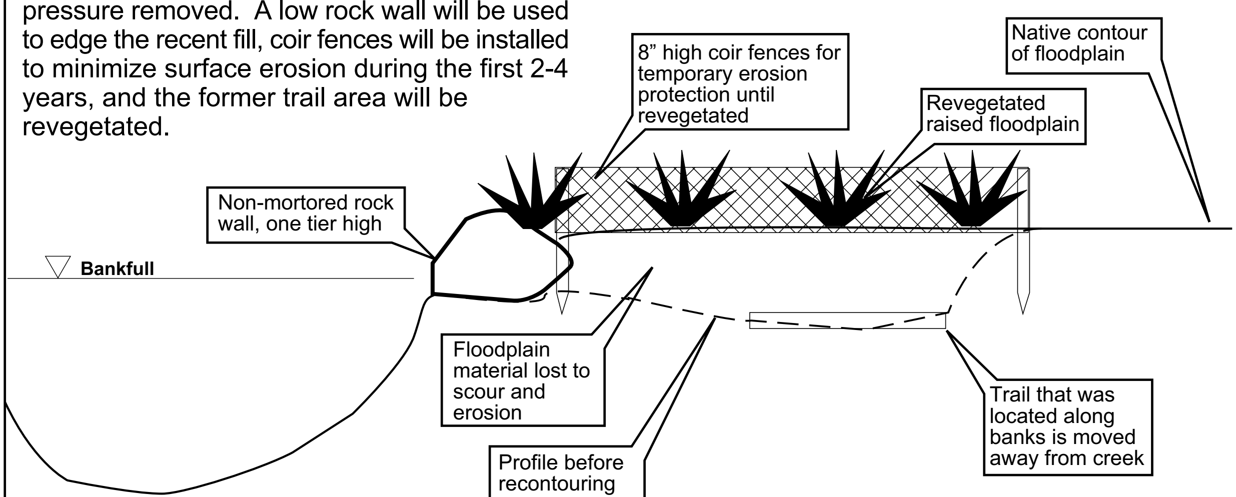
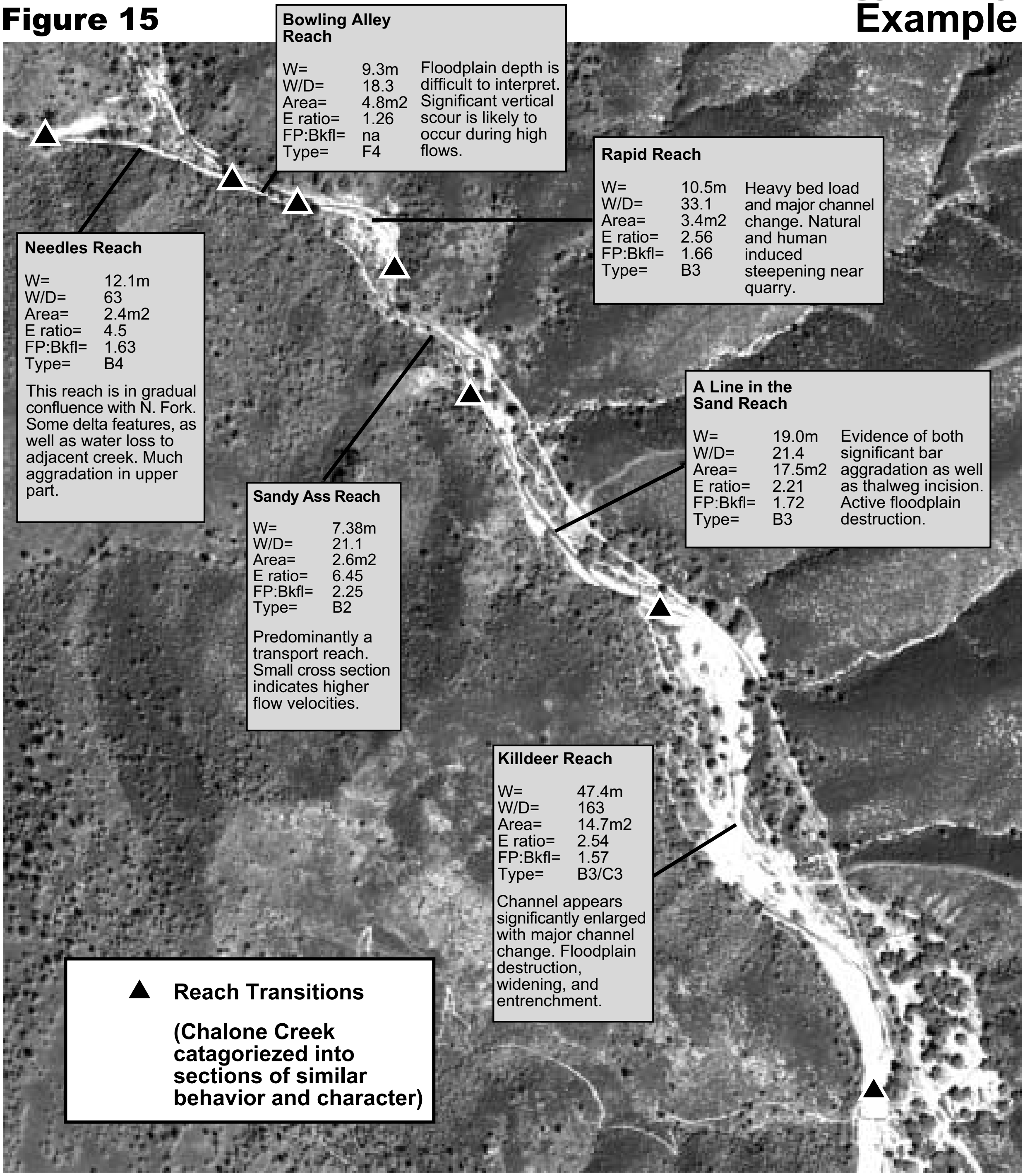


Figure 15

Geomorphology Study Example



Appendix: Wilderness Minimum Requirement Decision